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The Role of Education and Fertility in the Participation and Employment of African Women in South Africa

By

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**A minor dissertation submitted in partial fulfillment of the requirements for the
award of the degree of Master of Social Science in Economics**

School of Economics

Faculty of Humanities

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2000

Compulsory declaration

This work has not been previously submitted in whole, or in part, for the award of any degree. It is my own work. Each significant contribution to, and quotation in, this dissertation from the work, of other people has been attributed, and has been cited and referenced.

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ABSTRACT

Policy makers are well aware that creating jobs is an important priority if the health of our economy is to be preserved and improved. However, the first step towards a successful strategy of employment creation is an understanding of the labour market. The aim of this paper is to add, in a small way, to that understanding. Our focus is on African women, looking at the extent of the influence of education as well as fertility on their participation and employment.

The paper begins with a review of labour supply theory, focusing on the basic model of labour force participation. This is followed by a review of South African literature on participation. The aim of this chapter is to show what work has been done in this area and what contribution this paper makes. The following chapter looks at the relationship between education, fertility, and employment. We find that education is negatively related to fertility but positively related to employment. We also find that fertility and employment are negatively related. This is followed by regression analysis. Our conclusion is that education plays a significant role in the participation and employment of African women. In addition, we find that fertility has an insignificant effect on participation of African women in the labour market. This is likely to be a result of the fact that African women are relatively poorer than the rest. Support of this view is shown by the finding of a significant effect of fertility on the participation of White women.

Acknowledgements

I would like to thank Prof. Murray Leibbrandt, my supervisor, for the generous giving of his time and knowledge and for providing inspiration and shedding light at times when I needed it most. I would also like to thank Prof. David Lam for having encouraged me to write on this topic and for the discussions we had at the initial stages of this study. I am grateful to Prof. Francis Wilson at SALDRU for allowing me time to work on this thesis.

In addition, thank you to my colleague at SALDRU, Mathew Welch, for technical support and helpful discussions of output. Special thanks to Zuki for being a constant source of joy as well as to my mother (Myliss) and Denyse Avni for providing support at home.

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Introduction

Much has been written internationally about the positive benefits of education on employment. It is a widely held view that education encourages participation in the labour force. Where women are concerned, fertility is often cited as a mechanism through which education impacts on employment. The argument is that the more educated women are, the less children they have. Better opportunities are available to them in the market and the opportunity cost of childbearing is thus raised. It seems then that education pulls women into the labour market whereas childbearing pushes them out. The chief aim of this paper is to investigate the extent to which this is true for African women.

We could find that as education levels increase, there is no corresponding increase in participation. Indeed, such a finding has been documented by Lam and Duryea (1998) in a study of Brazilian women. Their explanation for such a finding was that some relatively well educated women choose not to work but rather to invest their education in raising better quality children. Chapter 3 looks at the relationship between education, fertility, and employment for African women with the aim of ascertaining whether such a phenomenon is prevalent in South Africa.

However, we begin with a review of the theory on labour supply in order to lay a foundation for the analysis of participation that follows in later chapters. This review also discusses factors that affect women's employment in particular, such as marriage and child bearing. We then review South African literature on participation, focusing on Winter (1997) who offers the most comprehensive investigation of this topic to date. In this chapter we also point out the contribution made by this paper.

Chapter 1

A review of labour market theory

1.1 Introduction

An understanding of the theory of labour supply is helpful in grasping the analysis of women's labour market participation that is to follow. This chapter thus deals with the principles of labour supply. The discussion will focus on the basic Neo-classical model of participation in the labour force. Weaknesses in the theory will also be highlighted and extensions to the theory will be discussed.

1.2 The theory of labour supply

The Neo-classical theory of labour supply indicates that an individual has the choice of either working for an income or spending her time on leisure. The income received is needed to buy utility-yielding commodities. For each additional hour worked an hour of leisure is foregone. The individual also derives utility from leisure therefore the leisure time foregone as a result of working has to be compensated for by the income received. The individual maximises the utility function

$$U = U(Y, L) \quad (1.1)$$

subject to a time constraint requiring that all available time (T) be spent either at work or at leisure:

$$H = T - L \quad (1.2)$$

where L and H represent leisure and labour supply respectively

and an expenditure constraint limiting expenditure on commodities (in the absence of unearned income) to total earnings from work:

$$Y = wH \quad (1.3)$$

where w is the hourly wage rate. The two constraints may be combined into a single budget constraint:

$$Y = w(T - L). \quad (1.4)$$

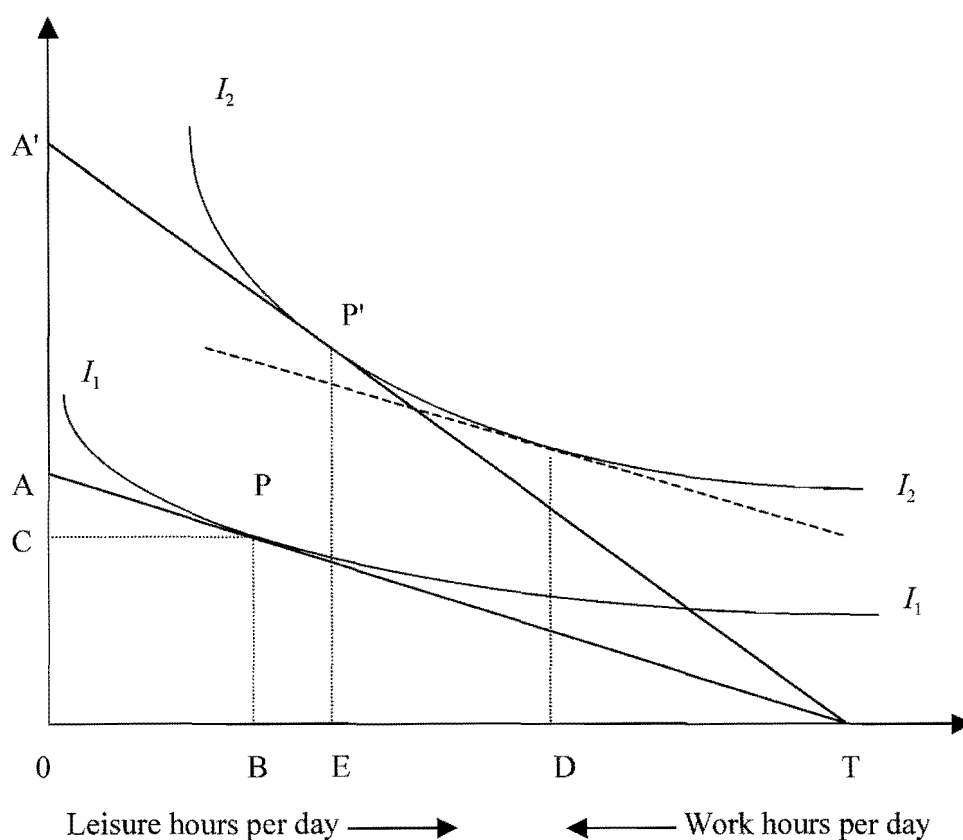


Figure: 1.1

The line AT in the above diagram is one such constraint. It shows all the combinations

of income and leisure available to the individual given the hourly wage rate (w). From the utility function, indifference curves such as I_1I_1 may be derived, showing the various combinations of income and leisure which yield equal levels of utility. Given the individual's budget constraint, equilibrium is established at point P , on the highest available indifference curve. BT hours are spent at work daily for a daily income of OC and OB hours of leisure are enjoyed.

A more formal statement of the above maximisation problem may be represented as follows:

$$U^* = U(Y, L) + \psi[w(T - L) - Y] \quad (1.5)$$

The partial derivatives obtained from the above Lagrangeian function are then set to zero to obtain, after manipulation, the first order condition for a maximum:

$$W = du/dL / du/dy$$

This states that the real wage must equal the ratio of the marginal utilities of leisure and income. This means that the slope of the budget line AT must, in equilibrium, equal the slope of the indifference curve, as is the case at P .

Furthermore, the individual's decision on how many hours of leisure to give up is influenced by a number of factors. If work is treated as a good then its demand as with most goods is a function of three factors:

1. the *opportunity cost* of the good (which is often determined by the market price),
2. one's level of *wealth*, and
3. one's set of *preferences*.

Therefore in deciding how many hours to work, an individual is firstly influenced by the opportunity cost of leisure. That is the income that would have been earned had work been undertaken instead. In other words the cost of spending an hour sunbathing at the beach is basically what one could earn had one spent that hour working. It can thus be said that the opportunity cost of leisure is the wage rate.

Wealth, the second factor influencing the decision to work, is largely made up of a family's holdings of bank accounts, financial investments, and physical property. Workers skills can also be thought of as assets, since these skills can be rented out to employers for a price. However, measuring wealth is usually very difficult and non-earned income is often used as a proxy for wealth.

In addition, the effect of preferences is seen where individuals with the same observable characteristics supply different hours of labour even though they could earn the same wage. These labour supply differences result from differences in utility functions, that is tastes for work. To some extent age, sex, race and other observed variables account for varying behaviour among individuals. However, even persons in the same age-sex-race group may still display varying labour supply behaviour as a result of differences in tastes for work. Factors related to tastes for work are by definition unmeasured in any data set.

Furthermore, there may be instances where the person's indifference curves are at every point more steeply sloped than the budget constraint (see Figure 1.2). Steep indifference curves indicate that the person places a very high value on an extra hour of leisure. A very high hourly wage would be required to compensate the person for an hour of lost leisure. If the increase in the wage required to compensate the worker for an hour of work is greater than the wage rate at every feasible number of leisure hours, then the person will simply choose not to work. Figure 1.2 indicates that utility is maximised at point D , a point of zero hours of work. Point D is however not a tangency point because the indifference curve I_2 has no points where its slope equals that of the budget line. Utility is thus maximised at a corner and the individual chooses not to work.

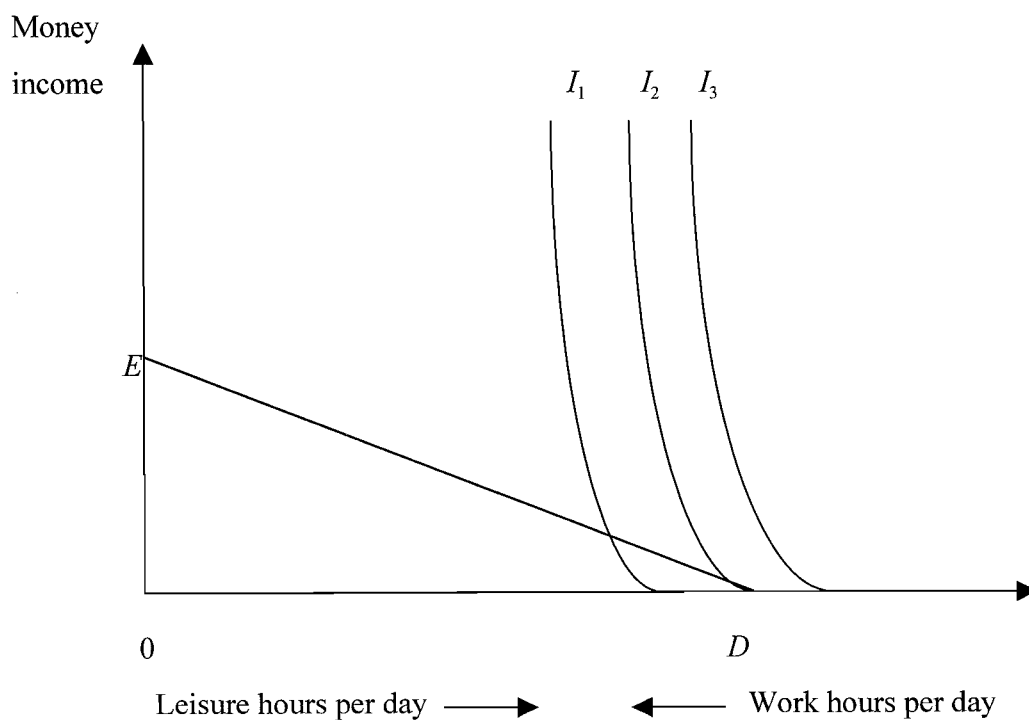


Figure: 1.2

Another important concept that arises when considering corner solutions is that of the reservation wage. This may be defined as that wage below which an individual is unwilling to accept a particular job offer, preferring instead to opt for non-participation (Sapsford & Tzannatos 1993). Consider figure 1.3, with a wage rate equal to the gap between BY_0 and FY_0 the individual maximises utility by selecting the corner solution at Y_0 where the budget constraint is tangential to I_1 . For all wage rates below the slope of I_1 at Y_0 the budget constraint becomes flatter and the utility maximising solution remains unchanged at Y_0 . However, if the wage were to rise such that the individual's budget constraint becomes DY_0E then an interior solution at point A would result. This indicates that at the higher wage the individual maximises utility by participating in the labour market to the extent of $(C - D)$ hours per day. The wage rate equal to the corner solution at Y_0 is known as the individual's reservation wage since for any wage above it, the individual will choose participation in preference to non-participation.

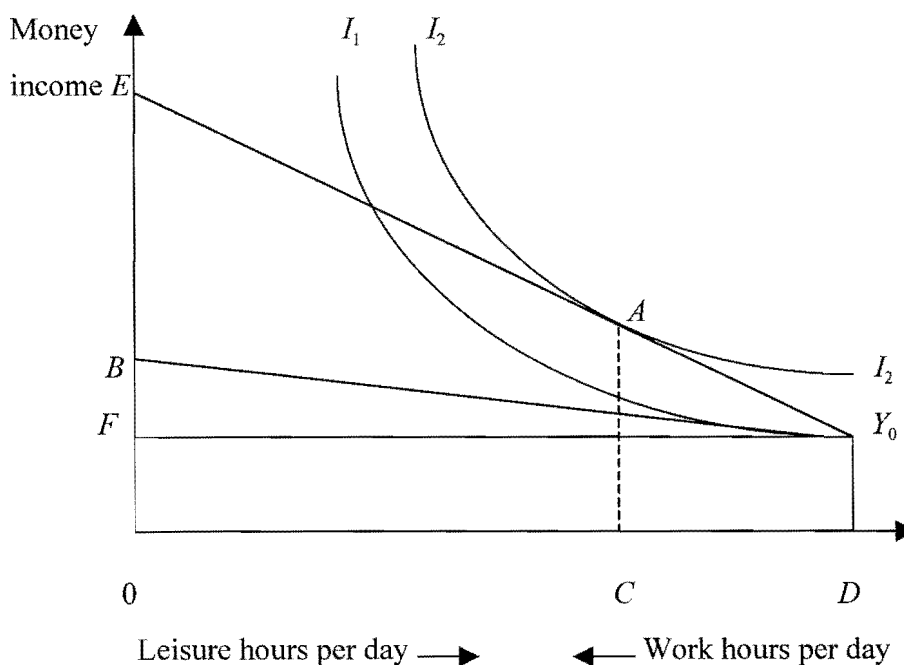


Figure: 1.3

Equation (1.6) is another way of representing the relationship between demand for leisure and its influences: $D_L = f(w, Y^+)$ (1.6). The notation indicates the direction in which the demand for the good is expected to go when the variable in question increases. Assuming that leisure is a normal good, then if income rises, holding other variables constant, the demand for leisure rises. In other words a rise in income results in less labour hours being supplied. This is known as the income effect. The income effect is thus defined as the change in the hours of work (σH) produced by a change in income (σY), holding wages constant:

$$\text{Income effect} = \sigma H / \sigma Y < 0 \quad (1.7)$$

The income effect is said to be negative because as income rises, hours of work fall. Equation (1.7) also indicates that as wages increase, holding income constant, the demand for leisure decreases and work incentives are thus increased. This is known as the substitution effect because as the opportunity cost of leisure rises, working hours are substituted for leisure hours.

In contrast to the income effect, the substitution effect is positive and may be represented as follows:

$$\text{Substitution effect} = \sigma H / \sigma w > 0 \quad (1.8)$$

Referring back to Figure 1.1, a rise in the wage rate establishes the new budget line $A'T$ and a new equilibrium position at P' . In this case the strong income effect (BD) has outweighed the relatively weak substitution effect (DE) to reduce hours of work (increase hours of leisure) by (BE). In this case the individual's supply curve slopes

upwards from right to left but had the substitution effect been stronger, the supply curve would have had the more conventional left to right upward slope.

A pure income effect or pure substitution effect may be observed at times but it is more common to observe a simultaneous working of the two against each other unless leisure is inferior, in which case they work together. In many cases there is thus ambiguity in predicting the overall labour supply response to policy or market changes. An individual's response to a wage change will depend on which is the stronger of the two effects. If the income effect is dominant, the individual will respond to a wage increase by decreasing labour supply. Her labour supply curve will thus be negatively sloped. If the substitution effect dominates, labour supply will increase with the wage rate and the labour supply curve will be positive.

Under normal circumstances an individual's labour supply curve should be characterised by both positive and negative slopes at different ranges of wages. At low wages the individual is expected to supply more labour hours as wages increase. Beyond a certain wage the individual is then expected to supply fewer hours of labour. This is termed the backward bending supply curve. However, the labour market as a whole is not characterised by this phenomenon. This is because different persons enter the labour market at different wage rates, and if these are all added, the backward-bending part of the labour supply curve disappears. For the labour market as a whole, the labour supply curve is therefore positively sloped (Barker 1995).

It is interesting to note that when thinking about the income and substitution effects associated with a normal good, conventional consumer demand theory dictates that the two effects will act in the same direction. For example, if the price of a normal good

such as lettuce rises, then both the income and substitution effects will lead to a decrease in its consumption. Yet the labour supply model outlined above states that an increase in the price of the normal good known as leisure results in the income and substitution effects acting in opposite directions, with the substitution effect reducing leisure consumption but with the income effect raising the demand for leisure.

At first it seems there is inconsistency in the theory, this is not so however. Conventional demand theory usually refers to goods that people consume but do not sell. Leisure on the other hand is a good that an individual not only consumes but also sells in the form of labour hours. Why should this make any difference? Consider a farmer who not only consumes lettuce but also grows and sells it. A rise in the price of lettuce will, to some extent, cause the farmer to substitute other goods in place of lettuce. However, the price of lettuce will also raise the farmers real income. The two effects thus operate in opposite directions.

Although economic theory is unable to predict whether the income effect or substitution effect dominates, it sheds useful insights on important policy issues. For example, supply-side economists predict that a tax cut to workers will increase work effort. Is this prediction theoretically sound? It seems so. While at any point in time individuals or small groups of people can experience income effects if their wages change, workers as a whole cannot. The potential wealth of a society is more or less fixed at any point in time by the resources it has available to it, and changing the wage rates of workers does not change this potential wealth. Therefore income-tax-rate reductions for everyone would be accompanied by a substitution effect but not by an income effect, and labour supply would then increase.

To further demonstrate the usefulness of the above theoretical model, consider labour supply behaviour during the course of the business cycle. On the one hand, overall labour force participation generally falls as the overall unemployment rate rises. This phenomenon is known as the discouraged-worker effect (Sapsford & Tzannatos 1993). On the other hand, labour force participation among married women whose husbands are unemployed is generally higher than it is among women whose husbands are employed. This phenomenon is known as the added-worker effect.

These two seemingly contradictory patterns can be reconciled. The cyclical downturn generally reduces real wages meaning that, other things being equal, some individuals whose wage rate previously exceeded their reservation wage now find that their reservation wage exceeds their real wage rate. They will no longer desire to work. However, “other things” are not equal for some workers, including, of course, persons whose spouses become unemployed during a cyclical downturn. A reduction in the income of an individual’s spouse under certain circumstances tends to reduce that individual’s reservation wage (Killingsworth 1983). Provided the reduction in the market wage does not exceed the reduction in the reservation wage, the individual will seek work. Hence the added-worker effect among persons in households in which members are (or have recently become) unemployed.

In the above model leisure is accounted for in very simple terms. A more realistic model should, however, take into account time and foregone earnings (Becker 1965). Not all activities that are usually considered leisure activities have relatively important foregone earnings. For example night-clubbing is a leisure activity yet it costs relatively less in terms of foregone earnings because most firms are closed in the evenings. Conversely haircuts and child-care are also considered as leisure activities and yet they have

relatively large foregone earnings. Therefore, the relative importance of foregone earnings rather than any concept of leisure seems more relevant for economic analysis (Kerr 1986).

There are in fact three broad categories into which the use of our time can be divided: market work, non-market work, and consumption. Market work is the time spent working for an income. Non-market work is that time spent outside the sphere of market transactions, for example, time spent on housework or child care. The use of the term consumption as opposed to leisure is to point out that most leisure activities require the consumption of commodities, and that the consumption of commodities invariably requires the expenditure of time. In effect 'the human being is a multi-product firm' (Fisher 1971), a small factory in which inputs of time and commodities are combined to produce utility-yielding activities, whether these be clean houses and hot meals (as in the case of non-market work), or full stomachs and contented minds (consumption).

Figure 1.4 illustrates the division of time between leisure, market work and work at home (Sapsford & Tzannatos). Assume that a typical individual has a home production possibility frontier (*PPF*) with the usual property: home production increases at a decreasing rate. This because the first hour spent on cooking, for example, is expected to be more rewarding than one spent after 9 hours in a single day. Therefore *T-PPF* represents the individual's constraint in the absence of alternative uses of time. The slope of the tangent at any point along *PPF* represents the individual's marginal productivity at home and becomes zero where *PPF* meets the vertical axis. Assume finally that the individual would earn some positive wage in the labour market if he chose to work.

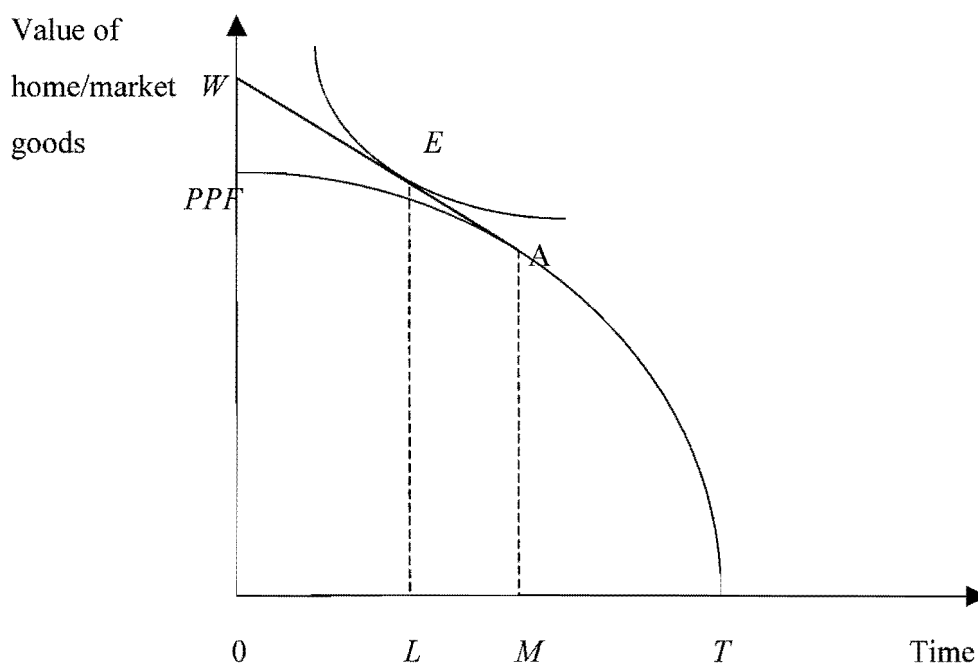


Figure: 1.4

Under our assumptions the benefit to time spent on home production becomes lower than the wage rate at points to the left of where the slope of the wage function forms a tangent to *PPF*. This means all points to the left of point *A* on Figure 1.4. The individual's constraint now starts at *T*, traces *PPF* till *A* and then follows the wage line *AW*. The model is now fully specified. The individual can be at equilibrium at any point along the non-linear constraint *TAW*. If equilibrium is at *E*, he consumes OL hours of leisure while he spends LM hours in the labour market and MT hours on home production. If equilibrium is to the right of point *A*, then he spends his time on leisure and home production and does not participate in the labour market.

Furthermore, an increase in the wage rate makes home production less attractive and point *A* shifts down to the right. As a result home production decreases and leisure

increases. The effect on work depends on whether the increase in leisure was greater or smaller than the decrease in home production.

The logic of individual choice dictates that the marginal productivity of time be equal in every activity. The real wage, which represents the marginal product of time spent at work, has increased substantially over the twentieth century. The marginal utility of consumption time has kept pace largely because it has become more goods intensive, with more and more goods consumed each hour (King 1980). Through technological advances, labour-saving devices have enabled women to substitute commodities for their time in non-market work and to thus allocate more time to market work.

Furthermore, the model outlined above is a standard model founded on a purely financial concept of the rewards of working (Dilnot & Duncan 1992). This view has been challenged extensively by psychological literature that seeks to extend the range of factors influencing the consumer choice problem. Information on factors such as age, ability, family status and demographic background of an individual would certainly explain an individual's likelihood to choose employment. However, even if an individual chose to work, there are a range of constraints to participation in the form of fixed costs to employment (transport to and from work, search costs and the possible costs of alternative childcare arrangements). In such cases the individual would work only if the benefit from employment outweighs the cost of participation. Although the basic model accounts for financial benefits only, there have been developments that relax this restriction.

Some academics accept the spirit of the theory, but challenge the assertion that individuals are sufficiently free to realise their desired labour supply in the face of

institutional and social constraints on behaviour (King 1980). Others blame unobservable random preference variation and measurement and optimisation errors for the deviation of predicted from actual behaviour (Flanagan et al 1984). It is indeed plausible that the budget constraint is observed with error by those who make labour supply decisions. The budget constraint facing individuals may be so complex that they are unable to view their own choice set with accuracy. A good example of the complexity of an individual's budget constraint is the case where the individual works to earn a given income and the alternative scenario where the individual remains unemployed with the same income being provided entirely by the state (someone on Income Support being offered a part-time job). The neoclassical model demands that the second alternative will always be preferred to the first, whereas a more accurate model would acknowledge that the rewards for working can be expressed as much in terms of social and personal esteem as on purely financial grounds.

It can be argued that compared to financial rewards, promotion and added responsibility are equally attractive rewards to work effort. Current wages are by no means always the best guide to the degree of motivation. Low paid workers may endure their hardship with the aim of gaining experience and improving their job prospects. Therefore "dead-end" jobs with few promotional opportunities may be more incentive-sensitive than professional careers with prospects of remuneration in the future.

Moreover, it is single parent work patterns that are perhaps best characterised using a utility maximising approach founded more on short-term financial considerations than long-term career goals. This results from the fact that, among the population as a whole, single parents face relatively strong non-work obligations conflicting with their desire to earn a decent income through working. Effectively, the 'demand' for leisure for a given

price (wage rate) will be relatively high for the single parent. If the wage rate faced by a single parent with sufficient earned income dropped, the likely response would be an increased consumption of leisure. A single parent with low labour supply and income on the other hand would respond by increasing her supply of labour in order to maintain the same level of income and living standards. These two responses are the effects of the income and substitution effects working in opposing directions as explained earlier.

The labour supply of single parents has been the subject of much recent research (Dilnot & Duncan 1992). The reason being that while some demographic groups such as prime-age married males display little labour supply flexibility, it has become clear that the hour responses of single parents are relatively sensitive. In particular, results have consistently shown the hours function of single mothers to be forward sloping at lower hours/wages combinations, becoming backward bending as wages increase.

Furthermore, labour market trends in the United States reflect that women who are married with spouse present are generally less likely to work outside the home than other previously married women, that is, women who are separated from their husbands, divorced, or widowed (Blau et al 1998). Further studies have found that within the married, spouse present group, labour force participation is negatively related to husband's income, all else being equal (Strauss & Thomas 1995). It is interesting to note that figures released by the U.S. Bureau of Labour Statistics reveal that over the period 1966-94 differences in participation by marital status have narrowed. In 1966, the participation rates of married women in the U.S. were 17 to 28 percentage points lower than those of other ever married women. By 1994 the difference was only a few percentage points for those women with children aged three years or older. For women with children over three years of age, the relationship had actually reversed with married

women showing higher participation rates (Blau et al 1998).

The same study shows that among married women, wives' participation decisions have become less sensitive to their husband's income in recent years and more sensitive to their own market opportunities, that is, to the wage they can earn in the market. In addition, the statistics reflect that although the presence of small children continued to be an important determinant of women's labour force participation, women with small children were considerably more likely to work outside the home in the 1990s than in the 1960s. The preceding discussion sets the stage for a review of some of the recent South African and international empirical studies on participation that now follows.

1.3 Conclusion

This chapter has dealt with the Neo-classical account of labour supply. It was noted, however, that the theory is limited in that it provides only some of the basic principles of labour supply and that in reality the labour supply function is much more complex. Among the factors that complicate the decision to supply labour are the following: tastes for work, prospects of promotion, the need to gain experience, search costs, marital status, and child-care. We will draw on the principles discussed in this chapter in analysing results in following sections of this paper.

Chapter 2

Reviewing South African and international literature on participation

2.1 Introduction

This chapter discusses some of the recent work on employment in South Africa and internationally. It serves as an indication of the focus that studies in this area have taken on. This in turn highlights areas where more research needs to be carried out. We discuss Winter (1997) in greater depth than the rest because this study offers the most extensive coverage of participation to date. The latter part of the chapter draws on international literature in discussing the influence of factors such as marriage and child bearing on women's employment.

2.2 Reviewing the literature

Using the October Household Survey (1994), Winter (1997) looks at the differences between the participation rates of men and women in the formal sector. Winter argues that, given that educational attainment is a good indicator of human capital, the participation of men and women should be more or less similar seeing that investment in their education is more or less equal in South Africa. Race is found to be a significant influence on the degree of participation. Whites display the highest participation rates at 45 percent while that of Africans is 21 percent. Coloureds and Asians lie in between at 39.5 percent and 35.8 percent respectively. If women alone are considered the results are even more staggering. Almost 40 percent of Whites participate compared with just 13 percent of Africans.

The paper then proceeds to the influence of education on participation. No significant differences are found in men's education and women's education within races when the total population is considered. However, when the sample is restricted to formal sector

workers, gender differences in average years of education are almost two years higher among Africans and almost one year higher among Coloureds. Overall women's participation is found to display a positive relationship with increasing educational attainment. Therefore, among all women, education seems to be a predictor of participation. The paper reports that those with no education have a much lower probability of participating (almost 6 percent lower) than women who completed primary schooling. Women with completed secondary education (matric) have a 23 percent higher probability of participating than those with primary school, and those at the diploma level have almost a 33 percent higher probability.

This strong link between education and employment opportunities has been widely documented in economic literature. However, among women it is not always evident that the higher their educational attainment the more they participate in the labour market. For instance, the participation of South African women is low, indicating there are factors other than education affecting it. Recent literature has suggested that fertility and investment in children have a significant influence on the pattern of women's employment. It is our contention that any study of women's work tendencies should incorporate a detailed look at fertility seeing that childbearing affects women's employment. Although Winter does report some findings on fertility, her coverage of the subject and its relevance to women's employment is rather brief.

The rest of the South African literature deals with participation only indirectly. Fallon and Lucas (1998), for example, provide a study that focuses only on participants. The issue of participation is thus not dealt with. Hofmeyr (1998) investigates segmentation in the labour market, however, he splits his sample into those employed and those not employed. Those not employed include unemployed and non-participants. Thus, as

Bhorat and Leibbrandt (1999) point out, the model cannot provide useful information on either participation or on unemployment. Finally Mwabu and Schultz (1996a) look at returns to education by race. The participation decision is dealt with but not participation as a topic. Our feeling is that few studies have attempted an understanding of participation in South Africa and those that have, have attempted too broad a coverage. This paper chooses one section of the labour market, African women, in order to do justice to the topic.

Moreover, instead of looking only at the relationship between education and participation, exploring education and fertility as well, will most likely reveal some intriguing explanations of the low participation of South African women. Indeed, there has been empirical evidence on the link between women's education and fertility. Schultz (1993) states that women with seven or more years of schooling have substantially lower fertility than women with zero years of schooling in all parts of the world. Moreover, it seems logical that better educated women have fewer unwanted births. A negative relationship between education and desired family size has also been widely reported documented. There has also been evidence of the beneficial effects of the schooling of mothers on numerous health and human capital outcomes for children (Schultz 1993). A strong relationship also exists between mother's education and child survival. The effect of father's education also tends to be positive, although generally smaller than the effects of mother's education (Strauss and Thomas 1995). Therefore, the influence of raising children on a mother's decision to work should not be underestimated.

However, the causes of the negative relationship between mother's schooling and fertility are not well understood. One theory is that women's education increases female

autonomy, leading to later marriage, increased contraceptive use, and lower fertility (Mason 1986). This is supported by the finding that wife's education has a more negative effect on fertility than does husband's education, in line with the earlier review of labour supply. Economists have emphasised how increased schooling raises market wages and induces substitution out of time-intensive activities such as children. Strong negative effects of women's wages on fertility have also been found in a variety of countries, with wife's wages having a more negative effect on fertility than husband's wages (Lam & Duryea 1998). In part, this paper investigates the extent to which this phenomenon is prevalent in South Africa. That is, whether better educated women who could command higher salaries, opt for fewer children and greater participation in the labour market.

However, if better educated women are displaying low fertility rates but are not participating highly in the labour force, a plausible explanation for this could be that increased schooling of parents leads to a trade-off between quantity and quality of children. Thus parents reduce fertility at the same time that they increase investments in child quality. Assuming that schooling increases productivity in both the home and market sectors, the reservation and the market wage should rise with increased schooling. The increases in the productivity of women's time in home production may in turn cause reservation wages to rise as fast as market wages, especially at low levels of schooling (Lam and Duryea 1998). This may prevent increases in women's schooling from pulling women into the labour market, even if schooling leads to higher market wages.

Furthermore, given that the quality chosen for one child is related to the quality chosen for other children, the choice of child quality will affect the opportunity cost of adjusting child quantity. This implies that an increase in the unit price of quality (e.g. price of

schooling) will lead to a reduction of either quality or quantity. The question that has to be answered therefore is what the effects of increased parental schooling will be on the adjustment of child quality. It is theoretically plausible that an increase in parental schooling will lower the relative price of child quality, leading parents to increase the average quality of children and decrease the quantity of children (Becker 1991). A negative relationship between schooling and fertility would be observed but one that is not caused by increased time dedicated to labour market participation. However, reservation wages may rise as fast as market wages at low levels of schooling, but rise more slowly than market wages at higher levels of schooling. In this case a negative relationship between schooling and participation would be observed at low levels of schooling whereas participation would increase at higher levels of schooling.

Furthermore, the effect of schooling on participation of women can be said to be driven by trade-offs along two sets of margins. The one margin is the race between home productivity and labour market productivity, driving the extent to which better educated women are pulled into the labour force by higher wages. The other is the adjustment in child quality and quantity that results from the effects of schooling on home productivity (Lam & Duryea 1998).

The methodology of this study is to look first at the distribution of schooling in South Africa. Included in this analysis will be a brief look at the differences in educational attainment between men and women as well as differences between different age categories and how these have changed over time. In addition, an investigation of the relationship between schooling and fertility will be carried out. The aim of this analysis is to ascertain the degree to which the widely documented view about the negative relationship between fertility and education holds among African women in South

Africa. This will be followed by a look at the relationship between fertility and employment. It is anticipated that marital status will have a strong influence on the participation decision. Furthermore, age and number of children are two additional factors that are likely to play an important role in women's work patterns. A detailed analysis of the participation and employment of African women will form an important part of this study.

2.3 Conclusion

We have reviewed some of the more recent South African literature on employment. We found that most studies attempt a broad coverage of the labour force. However, focusing on a particular section of the labour force, African women in our case, may be advantageous in the sense that a more in depth investigation can be conducted. The following chapter does exactly this. It investigates the relationship between education, fertility, and employment in order to understand the nature of the forces at play where women's participation is concerned.

Chapter 3

Preliminary analysis

3.1 Introduction

The purpose of this chapter is to provide insight into the pattern of education, fertility and employment among African women, through basic data analysis. Consider Figure 1.5 below. Schooling has a positive effect on participation as evidenced by studies cited in the previous chapter. By the same token, schooling is thought to have a negative effect on fertility by reducing the quantity of children born. Ordinarily this effect on fertility would in turn lead to a positive effect on participation as women have less children and more time available for market work. However, it is plausible that the decrease in quantity of children be accompanied by an increase in desire for higher quality children. In such a case the reduction in number of children would not be accompanied by increased time available for market work as this time would be devoted to raising better quality children. Lam and Duryea (1998) found this result in Brazil. We carry out a detailed investigation into the relationship between education and fertility, education and participation, and the three together in order to see whether this phenomenon exists in South Africa.

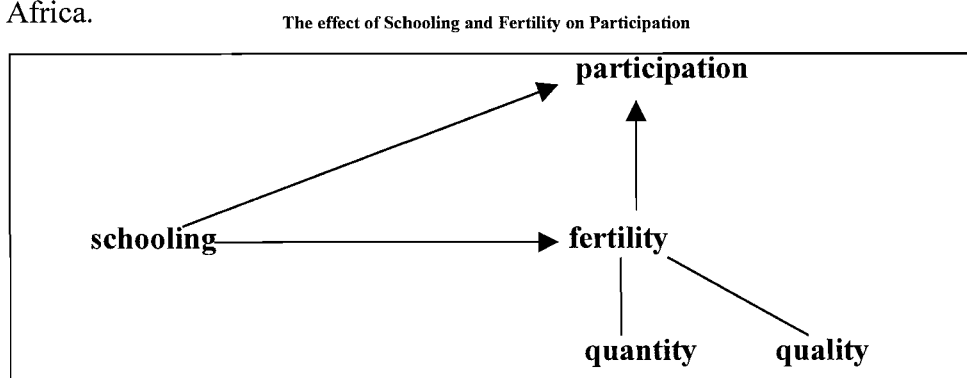


Figure 1.5: The effect of Schooling and Fertility on Participation

3.2 The data

The data used in this study was collected in the 1995 October Household survey. This survey was conducted by the Central Statistics Service (CSS). The OHS is an annual survey that was initiated in 1993 when one of its main aims was to collect information on the size of the informal sector. However, the survey has evolved since then and broader ranging questions on topics such as employment, living standards, and general household as well as individual characteristics are incorporated.

The 1995 survey questionnaire is divided into five sections. The first section asks questions at household level, and deals with the nature of the dwelling and the basic services and facilities available. Questions pertaining to the perceived quality of life of household members are also included. The second section collects information on the personal characteristics of each individual in the household, including issues such as family relationships, health and education. Section three aims to gather information about the labour market activities of household members. The questions seek to determine whether the respondents are employed, unemployed or economically inactive. Section four asks questions about mortality in the households whereas section five collects information about births. This study will use information gathered mainly from sections two, three and five.

3.3 Sampling issues

The survey covered 30 000 households and just above 100 000 individuals. It was conducted according to a two stage sample design, with ten households collected from each of 3 000 clusters. This is a fairly common method of sampling as it allows for increased efficiency in interviewing, and also the possibility of collecting community level information in individual clusters. Clustering of this nature will however generate

groups of observations that cannot be considered wholly independent, as observations from the same cluster will tend to show a degree of homogeneity. There will therefore be an overstatement of independent observations in the sample, and as a consequence standard formulas will inherently underestimate the variance of parameters (Deaton 1997). When using survey data of this nature, necessary adjustments should be made to cater for this limitation and indeed they have been made.

The OHS data set also has sample weights that enable scaling up of the sample to reflect the full population, and correct for over and under representation of certain types of households. Each observation has an attached weight that corresponds to the proportion of total population that that observation represents. Adjustments for both clustering and weighting have been used in this study. A number of observations were dropped in the data cleaning process and this accounts for any discrepancies that may arise with respect to the results weighted up to reflect actual population as in Table 5. In particular, clustering has been adjusted for by creating a new variable named 'distrea' which is 'district' multiplied by one hundred plus 'eneno' which is the enumerator area variable.

3.4 Choosing the relevant variables

Employment and participation were chosen as the two dependent variables. The main independent variables were education and fertility. Fertility, for the sake of the regression analysis, would be the number of children under the age of five. The existing variables had to be adapted in order to generate the required variables. Other variables thought to influence the participation decision were marriage, location (rural or urban), the presence of other household income and age. Furthermore, a number of observations were dropped as part of the data cleaning process.

3.5 The distribution of schooling in South Africa

Our sample consists of 23 756 African women aged 16 to 54. This age range was chosen because of the fertility element in our analysis; questions regarding fertility were asked of women between these ages in the survey. Table 1 below displays some statistics regarding the distribution of schooling among African women and men who are included for the sake of comparison.

Table 1:

<i>Distribution of Years of Schooling for Cohorts Aged 16-54 - Africans</i>								
	Sample Size		Mean Schooling		Standard Deviation		% < 1 Year Educ.	
	Male	Female	Male	Female	Male	Female	Male	Female
16-19	3705	4165	6.29	6.75	2.37	2.22	2.08	1.71
20-24	3752	4421	7.33	7.39	2.94	2.91	3.70	4.03
25-29	2912	3791	6.80	6.88	3.51	3.50	6.30	7.53
30-34	2365	3090	6.14	6.10	3.68	3.70	8.48	11.07
35-39	2177	2824	5.70	5.39	3.62	3.65	10.01	14.65
40-44	1657	2123	4.89	4.47	3.59	3.60	15.41	20.87
45-49	1448	1876	4.31	3.93	3.62	3.33	20.28	26.05
50-54	1009	1466	3.85	3.28	3.49	3.22	25.71	35.08
Total	19025	23756	6.09	6.00	3.41	3.47	8.50	11.60

Looking at the mean schooling for both men and women it is noticeable that there has been a steady increase in mean schooling from the older age-groups to the younger. This steady rise begins at 3.85 and 3.28 for 50-54 year old men and women respectively and ends as high as 6.29 and 6.75 for those aged 16-19. However, it should be borne in mind that many of those falling in the 16-19 category are most likely still studying. A truer reflection of the mean schooling of African youth would therefore be given by the 20-24 age category.

Table 1 also reflects the fact that the mean schooling for males was initially higher than that of females. This pattern is observed by looking at the 50-54 category up to the 30-34

category. Also noticeable within these five age-groups is that female gains in mean schooling have occurred at a faster rate than those of males. For instance, there was a 20% gain in mean schooling moving from the 50-54 cohort to the 45-49 cohort for women compared to a 12% gain for men. Similarly moving from the 35-39 category to the 30-34 category, female gains are 5% higher than that of men.

Furthermore, from the 25-29 cohort and younger, female mean schooling overtakes that of males. The lower female mean schooling for the older cohorts is likely to be the result of cultural factors. Traditionally among the African races, the education of girls was seen as an activity that offers little rewards for the parents. The prevailing view at the time was that a girl would at some stage marry and use that education to the benefit and enhancement of her husband's family rather than her own. It was believed that men would use their education to uplift their homes. The change in views is reflected by the fact that for the youngest cohorts, 25-29 and younger, mean schooling for women is higher than that of males. Nevertheless, gender differences in mean schooling for Africans are not shockingly high.

Furthermore, the last set of statistics in Table 1 show the percentage of men and women with less than one year of education within each age category. Once more we observe great improvements moving from the older to the younger cohorts. Of the oldest cohort, 26% of males and 35% of females have less than a year of education. Although the percentage of women with less than a year of education is greater than that of men for most of the categories, the female gains in education occur at a higher rate than that of males. Interestingly, the youngest cohort has a lower percentage of women than men with no formal schooling. Gender equality in educational attainment is likely to be the norm for future generations as women's rights gain wider recognition.

3.6 Schooling and fertility in South Africa

Schooling is generally seen as beneficial in that among other things, it empowers women to better control the number of children they have to conform with the number they wish to have. It is widely believed that a further sign of this empowerment is the reduction in child mortality that accompanies higher educational attainment of mothers. Figure 2 below shows the total number of children given birth (ever born) versus the number surviving at the time of the survey for all women aged 40 to 54.

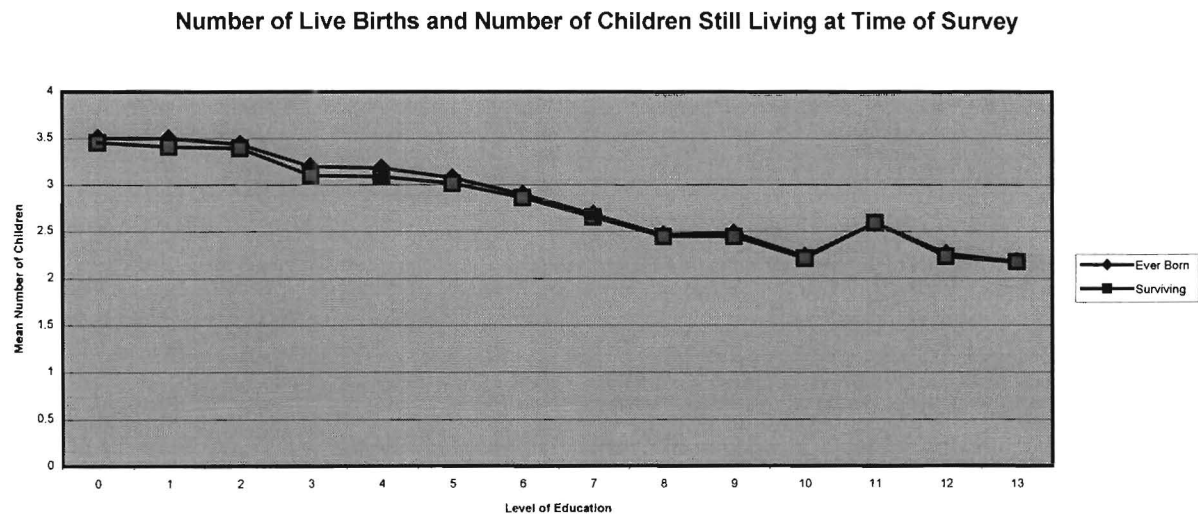


Figure 2: Number of Live Births and Number of Children Still Living at Time of Survey

This age category has been chosen with the view in mind that women over 40 generally have completed their childbearing. As can be seen in the diagram, the gap between children ever born and those still living narrows as educational attainment of mothers increases. The results of this analysis are more potent when children below the age of six are considered where the care of the mother has the greatest influence on the health of the child. As a result of the nature of the data, the age at which a child died cannot be

determined accurately and this methodology could thus be challenged on these grounds. However, the fact that the gap narrows with greater education of mothers shows that regardless of the age of children, mothers' education improves mortality rates of their children.

Table 2:

Distribution of Women's Schooling Within Age Categories					
0	11.68	15.19	22.19	24.95	34.38
1	3.72	4.96	6.26	7.25	6.07
2	5.76	5.91	6.41	6.66	7.44
3	5.89	5.84	6.55	7.2	7.09
4	6.57	7.9	8.9	9.59	8.32
5	9.16	10.94	10.98	10.23	9.48
6	8.38	10.69	12.48	15.19	12.35
7	8.32	6.69	4.71	4.26	3.96
8	10.42	10.59	7.68	5.76	5.25
9	6.12	4.85	2.68	2.13	1.09
10	15.15	9.28	5.18	3.09	1.91
11	0.84	0.85	0.75	0.48	0.41
12	6.5	4.96	3.91	2.4	1.84
13	1.49	1.35	1.32	0.8	0.41

Delving further into the distribution of education among African women, Table 2 displays the percentage of women in each age category with a specified level of education¹. For example, 12% of the women in the age category 50-54 have a standard 6 qualification whereas less than half a percent have a degree. Across-age-category comparisons can also be made. For example, close to 2% of the women aged 50-54 have a Matric (std 10) qualification whereas above 9% of those aged 35-39 have it.

Focusing attention on the shaded part of Table 2, 15% of women aged 50-54 have above a standard 6 level of education. This percentage improves to 19% for the 45-49 category;

¹ In all instances education level refers to the standard e.g. level 5 refers to standard 5; level 10 refers to standard 10 (matric); level 11 and level 12 refer to diplomas and certificates; level 13 refers to degrees.

26% for the 40-44 category; 39% for the 35-39 category; and 49% for the 30-34 category. The greatest gains in this range of education are observed when moving from the 40-44 age group to the 35-39 age group (13%) as well as moving from the 35-39 category to the 30-34 (10%). These gains are observed despite the fact that the sample sizes for these two categories are bigger than the rest. Stated differently, women born in 1955 and later have experienced vast improvements in educational attainment. Figure 3 displays this pattern most vividly.

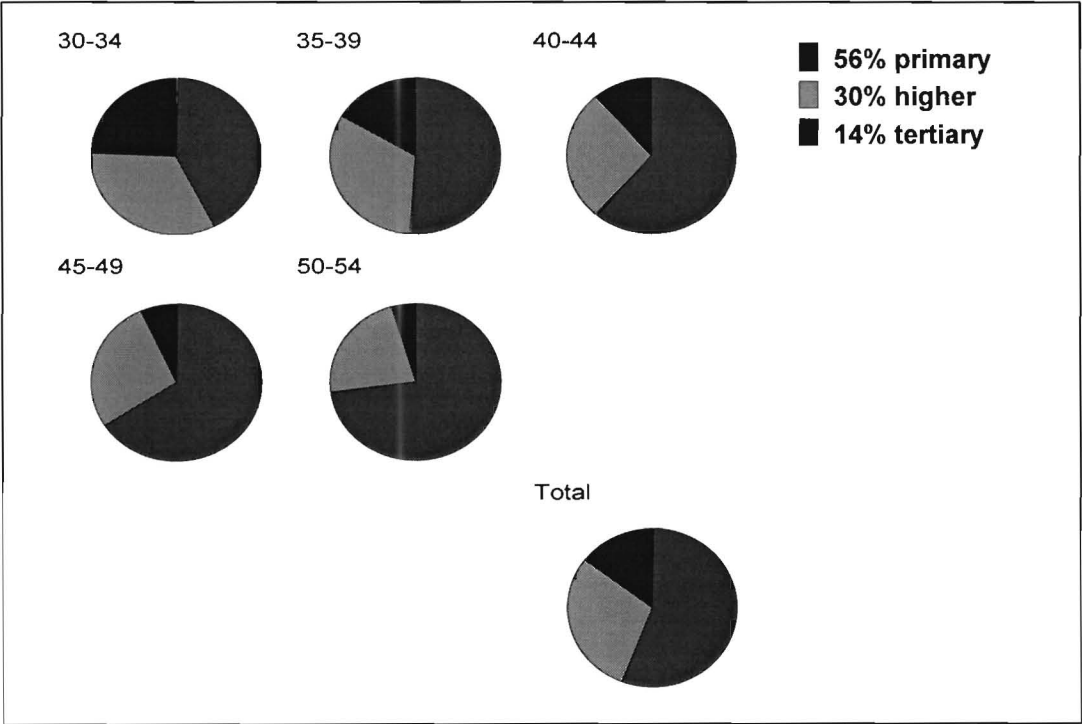


Figure 3: Distribution of Educational Attainment within Age Categories

Figure 3 shows pie graphs divided into education levels for African women in each age category. It can be seen that 56% of all these women have primary education while 30% have higher education and 14% have tertiary. In this instance primary means 0-7 years of education, higher means 8-12 years education, and tertiary means a diploma or degree.

When looking at the graphs starting with the oldest age category and moving towards the youngest, we see that the proportion of women with primary education decreases steadily whereas the proportions of the pies associated with women with higher and tertiary education increase steadily. A further investigation into the relationship between fertility and education for these women ought to yield interesting results and indeed it does. Table 3 shows the mean number of children born to women in each age category and education level by age thirty².

Table 3:

Mean Number of Children by Age 30 by Education Level - Africans						
0	2.00	2.44	2.35	2.12	1.97	2.18
1	2.40	2.74	2.57	2.24	1.81	2.42
2	1.98	2.40	2.36	2.40	2.13	2.24
3	2.06	2.35	2.18	2.06	2.15	2.16
4	2.20	2.31	2.28	2.05	1.90	2.19
5	1.84	2.28	2.36	2.09	2.25	2.14
6	1.84	2.12	2.30	1.99	1.91	2.04
7	1.72	1.91	1.90	1.85	1.91	1.82
8	1.77	1.93	2.20	1.79	1.93	1.90
9	1.57	1.98	1.96	2.18	1.69	1.80
10	1.71	1.75	2.19	2.09	1.65	1.79
11	1.83	1.58	2.00	2.00	1.00	1.78
12	1.47	1.82	2.03	1.47	1.42	1.66
13	1.55	1.93	1.96	2.27	2.25	1.83
Total	1.84	2.17	2.27	2.07	1.97	2.05

Looking at the mean totals for each age group, a rise in mean number of births is observed when moving from the oldest age group up until the 40-44 age group. The pattern then reverses for the next two age groups. The beginning of the decline in mean number of births coincides with the identified rise in educational attainment. That is women born after 1955 display a pattern of falling fertility accompanied by rising

²The variable 'number of children by age thirty' is an approximation that was calculated by subtracting the age of the child from that of the mother and assigning a value of one if the difference was found to be less than or equal to 30 and zero otherwise.

educational attainment. This feature is most clearly depicted graphically in Figure 4 below. Figure 4 shows the mean number of births by the time the women reach 30 years of age. The interesting aspect of this analysis is observing the changing pattern in fertility over time.

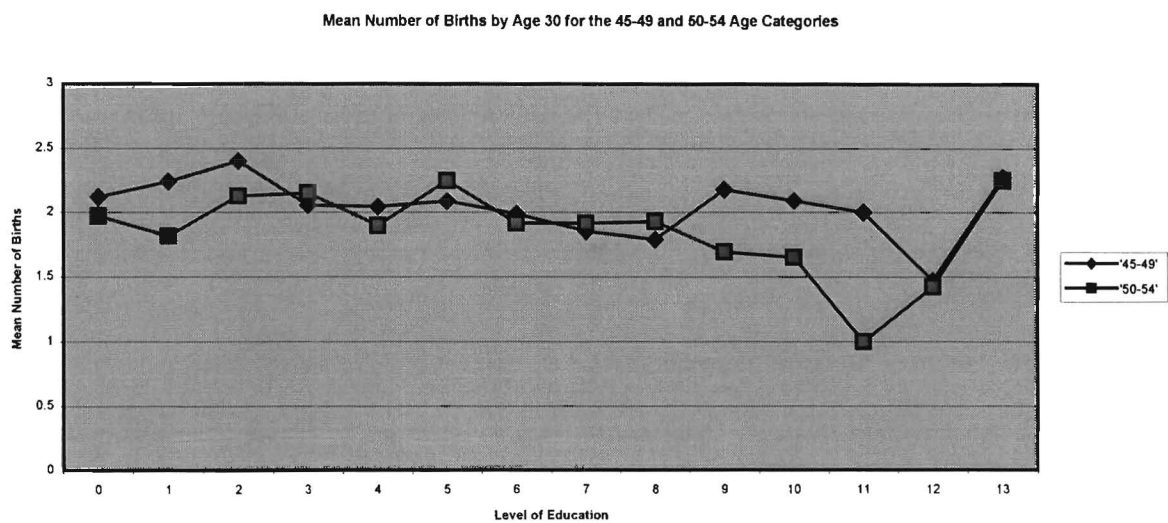


Figure 4a: Mean Number of Births by Age 30 for the 45-49 and 50-54 Age Categories

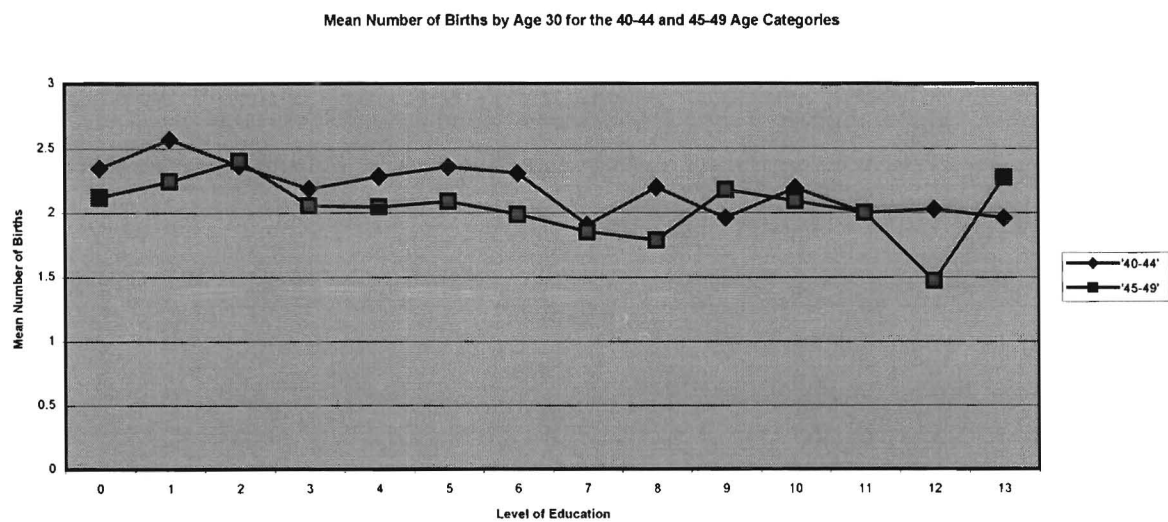


Figure 4b: Mean Number of Births by Age 30 for the 40-44 and 45-49 Age Categories

Looking at Figure 4a, no distinct pattern is observable among these age categories. It is notable that fertility is higher for the 45-49 age group at very low levels of education (below standard 3) and also at higher levels (above standard 9). Figure 4b on the other hand shows that the 40-44 age group had a rise in fertility by the age 30 for those women with less than a standard 9 qualification.

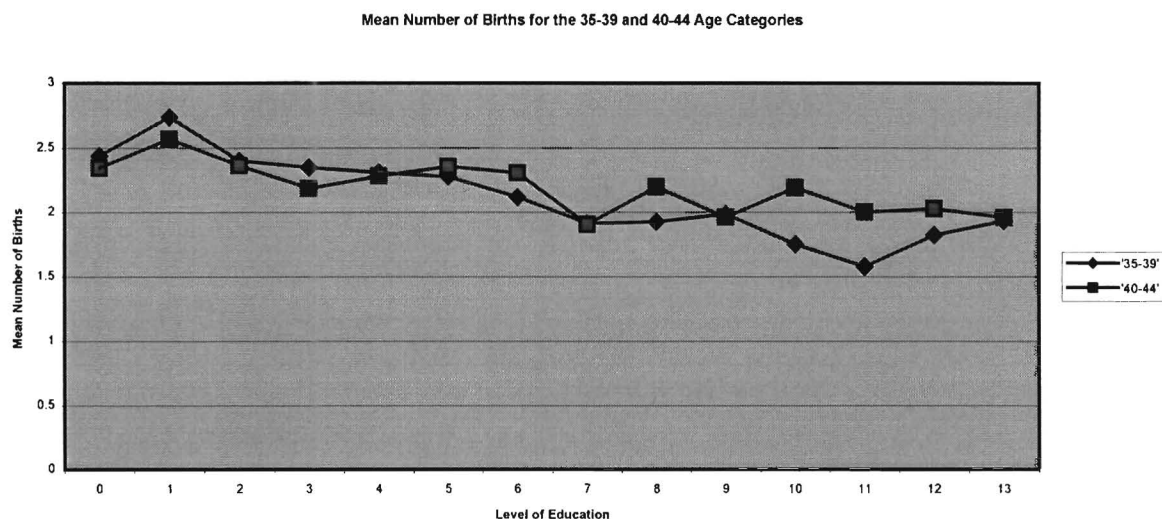


Figure 4c: Mean Number of Births by Age 30 for the 35-39 and 40-44 Age Categories

In addition, the data in Table 3 shows that for women in each education level up to standard four, mean number of births continued rising up until the 35-39 age group. However, in the higher education levels, mean number of births rose only as far as the 40-44 age group and then began falling. This result lends further support firstly to the idea that major gains in educational achievement were observed in women born after 1955 and secondly that these gains had an impact on fertility. Women with higher educational achievement began delaying child bearing prior to reaching thirty years in age.

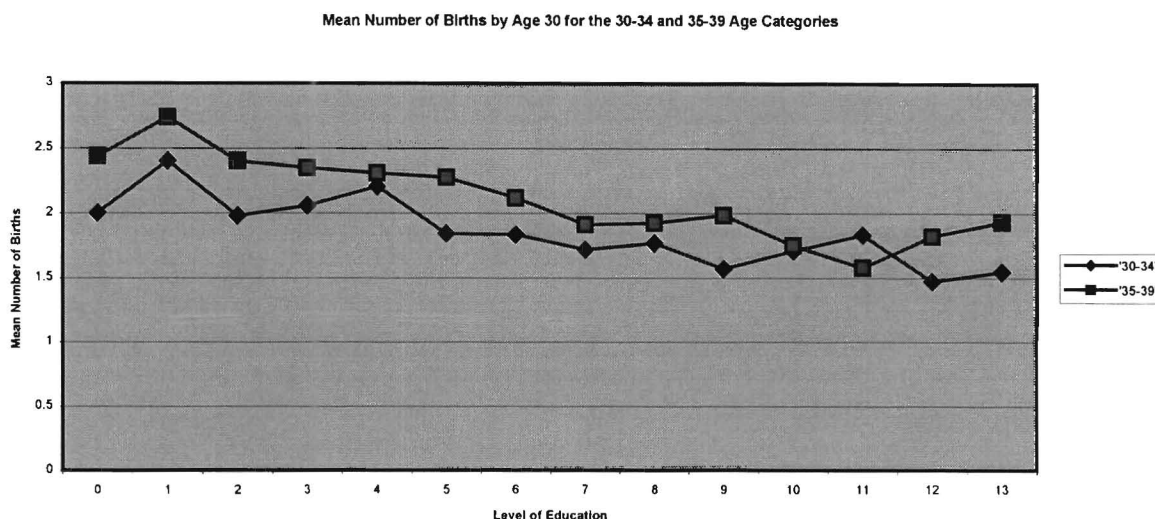


Figure 4d: Mean Number of Births by Age 30 for the 30-34 and 35-39 Age Categories

3.7 The Distribution of Women by Various Activities

Having looked at education as well as fertility, attention is now turned to participation and employment. The aim of this section is to gain a feel of how education impacts on these. This is achieved by looking at how women's engagement in the different activities varies with education. Table 5 shows the distribution of African women aged 16 to 54, by their current activity. The numbers have been weighted to represent actual population figures. We have defined participants as those who are working full-time, working part-time, absent from work, and looking for work. Those falling in the remaining categories have been regarded as non-participants.

It is evident that the majority of these women (25%) are involved in full-time studies whether at school, college or university. These are likely to be women between the ages of 16 and 24. The next biggest group comprises those women seeking work at 24%. Women in full time employment make up 22% of the sample. Therefore three quarters

of the women are evenly divided between full time work, no work, and involvement in studies. In addition, there are quite a substantial number (15%) of women involved in housekeeping activities.

Table 5:

Distribution of Women by Activity		
Working full time	1647914	22.46
Working part-time	245271	3.34
Absent from work	23974	0.33
Studying	1869778	25.48
Looking for work	1729126	23.56
Not looking for work	552655	7.53
Housekeeping	1096630	14.94
Retired	57355	0.78
Unable to work	113927	1.55
Other reasons	1840	0.03
Total	7338470	100

As already mentioned earlier, it is a general view that education expands women's opportunities in the labour market. We would expect therefore that the higher educated women who desired to work, would be in employment. Furthermore, by virtue of the better quality jobs available to better educated women, these women ought to choose to participate in the labour market rather than alternative activities such as housekeeping. This view ought to hold unless 'quality of children' turns out to be an important influence, in which case more time may still be dedicated to home activities.

What follows now is an analysis of the distribution of women in different activities by educational attainment. The sample has been restricted to those women aged 30 to 54 in order to provide meaningful analysis at a later stage when education, fertility and employment are brought together. Table 5.1 below illustrates some intriguing results regarding the change in the proportion of women in each activity as educational

attainment rises. The data reflects that 22% of women with no formal schooling are in full-time employment. This number increases gradually as level of education increases, culminating in 65% of women with post matric qualification in full-time employment. This result is in accordance with theoretical expectations. Furthermore, the percentage of unemployed women in each education level, excluding post standard 10, ranges from 22% to 27%. Although the variation in these figures is not large, it is noticeable that there is a gradual rise in the percentage of women looking for work as level of education rises.

Table 5.1:

Percentage of Women in Each Activity by Education Level - Aged 30-54							
Working full time	22.05	25.4	26.82	32.23	41.77	52.25	65.34
Working part-time	4.8	6.16	6.17	5.61	5.57	2.93	1.09
Absent from work	0.04	0.69	0.46	0.44	0.24	0.57	1.04
Studying	0.18	0.34	0.57	0.62	1.24	5.51	18.37
Looking for work	21.81	23.5	25.77	26.34	26.99	25.8	10
Not looking for work	10.21	8.74	11.39	8.21	5.61	2.75	0.96
Housekeeping	33.25	27.9	25.23	22.63	16.22	9.64	2.86
Retired	3.61	1.28	1.7	1.47	1.25	0.14	0.17
Unable to work	4.05	5.76	1.9	2.46	1.1	0.4	0.16
Other reasons	0	0	0	0	0	0	0

An interesting point, however, is that given that the percentage of full-time workers is rising with educational attainment why then does the percentage unemployed also rise. As a matter of fact, the percentage unemployed rises with percentage employed up until standard 8. A likely cause of this phenomenon is the poor labour absorptive capacity of the South African economy (Bhorat & Hodge). As educational attainment rises, an increasing number of women are pulled into the labour market though not all of them find work. Evidence of this is found by looking at the figures for those women not looking for work and those involved in housekeeping. The data in Table 5.1 suggest that

an increasing number of women move out of non-market activities and into labour market participation as education level rises.

Up to this stage we have looked at the relationship between education and fertility as well as that between education and activity. It follows then that to round out this section we should combine the three. Table 5.2 links education, activity, and fertility. It displays the mean number of births of women in each activity, by education level.

The main areas of interest in table 5.2 are full-time employment, looking for work, not looking for work and housekeeping. These areas contain the bulk of the women who are either participating in the labour market or those who could participate but choose not to. In all these categories a negative relationship between fertility and education is discernible.

Table 5.2:

Mean Number of Births for Women in Each Activity by Education Level - Aged 30-54							
Working full time	3.18	2.85	2.70	2.5	2.31	2.07	2.0
Working part-time	3.51	3.23	2.86	2.3	2.25	1.91	2.2
Absent from work	8.00	2.42	1.21	2.7	2.38	2.65	2.5
Studying	2.51	1.13	1.37	1.9	1.94	1.65	0.8
Looking for work	2.99	2.78	2.72	2.5	2.07	2.12	1.6
Not looking for work	3.11	3.37	3.28	3.1	2.42	2.25	2.4
Housekeeping	3.80	3.78	3.54	3.1	2.76	2.82	2.5
Retired	3.12	1.80	2.93	2.8	2.08	1.98	3.0
Unable to work	2.19	2.35	2.54	2.3	2.45	0.56	2.0

In comparing the average births between participants and non-participants some inferences could be drawn about the relationship between fertility and employment. The mean number of births for labour market participants is generally lower than that of non-participants. In other words, women in housekeeping have the highest birth figures,

followed closely by those classified as not looking for work. The average births for full-time workers and those unemployed are rather similar. This is a reasonable outcome considering that fertility should not influence whether a women is employed or not, once the decision to participate has been made.

However, comparing the average birth figures for the lesser educated participants (standards 0-4) with those of the better educated non participants (standards 8+) it can be seen that even though these women are engaged in full time employment their average births are higher than the better educated non participants. This observation shows that it is not clear cut that participants have lower birth averages than non participants but rather that the outcome is dependent on the strength of the influence of education. One of the goals of the regression analysis that follows is to determine precisely the strength of this influence on fertility.

Despite the relatively high level of education these women have, mean births for those in housekeeping are as high as 2.82 for matriculants and 2.5 for post matriculants. It is clear then that these women have chosen not to work but instead to bear children. Thus fertility is of its own accord an influence on the participation decision. Testing the strength of this push factor against the education pull factor is one of the chief aims of the next chapter.

3.8 Conclusion

The analysis in this chapter revealed that among the older age groups in our sample, male educational attainment is higher than that of females. We observed a reversal of this pattern from the 25-29 age group and younger. Also noticeable was a gradual increase in educational achievement when moving from the older to the younger age

groups. Furthermore, in answering the question posed at the beginning of this chapter about the role of child quality on the decision to participate, we found no evidence of this. A distinct negative relationship between education and fertility was observed. In addition, it was found that participation in the labour force is positively related to education. Determining the relative strengths of these relationships is the focus of the next chapter.

Chapter 4

Empirical modelling

4.1 Introduction

The analysis in this chapter seeks to determine the relative strengths of the effects of childbearing and education on the labour force activity of African women. It is theoretically plausible that education should have a strong positive influence on labour force participation. This is because education increases work prospects and those who are better educated are likely to engage in labour market activity. Indeed the analysis in the previous chapter supports this view. It was clearly observed that the percentage of women engaged in the labour force within each education level increased steadily as educational attainment rose. In addition, in accordance with the theory, it is expected that fertility has a negative effect on women's labour force participation. Raising children is a time intensive occupation that demands more time the more young children there are. This chapter also attempts to address this issue. The main aim of this analysis is to gain a greater understanding of the overall influence of these two opposing forces on participation.

4.2 The Regression modelling

Six variables have been chosen as independent variables in our model. The first is 'young ch' which denotes the presence of young children under six years of age. Throughout this analysis 'young ch' has categories 0-4. The next variable is 'married' and it takes on a value of one if a woman is married and zero otherwise. The third variable is education, labelled 'educat' which is the level of education attained. There are up to 13 levels of education, the thirteenth being a university degree. Level ten denotes a matric qualification which is a prerequisite for tertiary education. The fourth variable is 'rural' which takes on a value of one if a woman resides in a rural area and zero otherwise. The

following variable is 'otherinc' which takes on a value of one if there is another source of income in the home of the woman concerned. Age together with 'agesq' which is age squared are the last variables of the model. The relevance of the age quadratic will be discussed at a later stage.

We begin with multinomial regression analysis involving a dependent variable 'wact' with three categories: unemployed = 0, employed = 1, and not-participating = 2. This kind of analysis allows comparison of the influence of the independent variables if an individual is in one category as opposed to the comparison group. A convenient way to display otherwise complex results of the multinomial logit model is use of odds ratios. The odds of outcome m versus outcome n given x , indicated by $\Omega_{m/n}(x)$ equal: $\Omega_{m/n}(x_i) = \exp(x_i[\beta_m - \beta_n])$. Taking logs shows that the multinomial logit model is linear in the logit: $\ln \Omega_{m/n}(x_i) = x_i(\beta_m - \beta_n)$, (Long 1997:154).

Table 6 displays the results of a multinomial logit regression. Each category of the dependent variable has a 0 or 1 outcome. Looking at the results for category 2, the figures suggest that the odds favouring not participating over being employed (the comparison group) increase by 12 % with each additional child under the age of six that an African women has. Furthermore, marriage has a strong positive influence on the decision not to participate, with the odds favouring not participating increasing by 87% if a woman is married. Each additional level of education attained decreases the odds of not participating by 12%. Being in a rural area more than doubles the odds of opting out of the labour market. Age on the other hand seems to initially decrease the odds of participation up to a certain age, after which the odds increase with age. This is evident from the opposite sign of the age quadratic.

Table 6: Survey Multinomial Logistic Regression

pweight:	rnwt	Number of obs	=	11362
Strata:	<one>	Number of strata	=	1
PSU:	distrea	Number of PSUs	=	2066
		Population size	=	3563379
		F(14, 2052)	=	84.79
		Prob > F	=	0.0000

wact	RRR	Std. Err.	t	P> t	[95% Conf. Interval]	
0						
young ch	1.221844	.0485291	5.045	0.000	1.130285	1.320819
married	1.007891	.0623675	0.127	0.899	.8927111	1.137932
educat	.8861739	.0081882	-13.078	0.000	.8702606	.9023783
rural	1.198498	.0846502	2.564	0.010	1.043474	1.376554
otherinc	.4678631	.030781	-11.545	0.000	.4112301	.5322954
age	.8262438	.0418162	-3.771	0.000	.7481757	.9124579
agesq	1.001685	.0006193	2.724	0.007	1.000472	1.002901
2						
young ch	1.117799	.0432716	2.877	0.004	1.03608	1.205964
married	1.87027	.1134796	10.319	0.000	1.660454	2.106598
educat	.8759358	.0078267	-14.825	0.000	.8607204	.8914202
rural	2.396579	.1621348	12.920	0.000	2.098804	2.736601
otherinc	.5771384	.0351778	-9.018	0.000	.5121144	.6504186
age	.6914176	.0313596	-8.136	0.000	.6325737	.7557353
agesq	1.004512	.0005471	8.265	0.000	1.003439	1.005585

(Outcome wact==1 is the comparison group)

Turning to category 0 (unemployed), a striking feature of the results is that the effect of education on the odds of being unemployed over employed is similar to its effect on the odds of not participating over being employed. Furthermore, the figures reflect that the presence of each additional child under six years of age increases the odds favouring being unemployed over employed by 22%. This result raises an interesting argument that questions whether the presence of young children should influence the employment decision or the participation decision or both. Our feeling on the matter is that the number of children a woman has should not influence whether she is employed or not, once she has made the decision to participate in the labour market.

Although the above methodology provides estimates that are easy to analyse and

understand as well as allowing for convenient comparison between the three categories of the dependent variable, it nevertheless is not accurate given our standpoint. Two decisions are incorporated in the dependent variable. One is the decision whether to participate or not and the other is whether one is employed or not. It is thus not good practice to combine these in one variable especially when dealing with South Africa which has high involuntary unemployment rates. To overcome this problem the analysis will be carried out with a selection model at a later stage. More will be said about this procedure then. What follows now is an analysis of the participation decision on its own.

Table 7 displays the results of a logistic regression on participation. In this instance, the dependent variable, participation, takes on the value of one for participants and zero for non-participants. The categories 'employed' and 'unemployed' of the above multinomial logit regression have been collapsed into one category: 'participants'. The same independent variables as in the previous analysis have been included. The results indicate that the presence of young children does not have a significant influence on the participation of African women in the labour market even at the 10% level of significance. This is a very interesting outcome because it is contrary to theoretical expectations and the descriptive analysis carried out in the previous chapter. It would normally be expected that the presence of young children has a significantly negative effect on participation.

What the results show is that each additional child decreases the odds of participation by a mere 1% and additionally that this effect is insignificant. Part of the reason why the effect of young children is statistically insignificant is that there is interaction between this variable and the 'married' variable. Indeed, when 'married' is omitted from the regression, the young children variable becomes significant. However when the

regression is run for white women, the fertility variable is significant, suggesting that the results we observe for African women are not due solely to the interaction between these variables. In addition, the marriage dummy itself serves to represent a wide variety of culturally determined effects on household productivity and domestic activities that impact on labour supply. We therefore viewed it more prudent to opt for a fuller specification of the model by including both ‘young ch’ and ‘married’ in the regression equation.

Table 7: Logit Regression

African Women Logit Estimates

Number of obs = 11362
Wald chi2(7) = 704.62
Prob > chi2 = 0.0000
Pseudo R2 = 0.0869

Log likelihood = -6679.8504

(standard errors adjusted for clustering on distrea)

part	Odds Ratio	Robust Std. Err.	z	P> z	[95% Conf. Interval]	
young ch	.9883148	.0319687	-0.363	0.716	.927602	1.053001
married	.5367216	.0286135	-11.672	0.000	.4834706	.5958378
educat	1.085894	.008434	10.610	0.000	1.069489	1.102551
rural	.447037	.0282447	-12.743	0.000	.3949689	.5059691
otherinc	1.256045	.0665241	4.304	0.000	1.1322	1.393438
age	1.317977	.0511729	7.111	0.000	1.221401	1.422189
agesq	.9963634	.0004654	-7.800	0.000	.9954517	.997276

White Women Logit Estimates

Number of obs = 2551
Wald chi2(7) = 166.45
Prob > chi2 = 0.0000
Pseudo R2 = 0.0906

Log likelihood = -1530.1441

(standard errors adjusted for clustering on distrea)

part	Odds Ratio	Robust Std. Err.	z	P> z	[95% Conf. Interval]	
smch	.8205886	.0914851	-1.774	0.076	.6595192	1.020995
married	.2709155	.0421611	-8.392	0.000	.1996944	.3675377
educ_c	1.299436	.0552429	6.161	0.000	1.19555	1.412349
rural	.6017053	.1158512	-2.638	0.008	.4125676	.8775514
ohhinc	1.467641	.1553878	3.624	0.000	1.192609	1.806099
age	1.178563	.120143	1.612	0.107	.9651198	1.439212
agesq	.9975048	.001209	-2.061	0.039	.995138	.9998773

Besides, it is plausible that fertility has little effect on the participation of African women. When one considers that the majority of these women are poor, it is not difficult to understand that they would work regardless of the presence of young children. On the whole African women do not have adequate financial support that would enable them to spend significant periods of time out of work. Moreover, children may actually serve as a reason to work. Indeed, the regression run for White women reveals that the odds of participation decrease by 18% with each additional child and that this result is significant at the 10% level of significance. Even when 'married' is left out of the regression for African women, on the other hand, their odds of participation shift to a decrease of only 7% with every young child present. It is our contention that the relative affluence of White women affords them the opportunity to stay at home and look after children.

Moving on to the next explanatory variable of interest in our regression, it is found that the odds favouring participating in the labour market increases by 9% with every unit increase in level of education. This result concurs with that displayed in Table 5.1 in the previous chapter where steady gains in the numbers of women participating were observed with each unit rise in education level. Thus as far as participation goes, the expected trade off between fertility and education has not been observed among African women. Although education has a strong positive influence on participation, the influence of fertility is insignificant.

Furthermore, marriage has a significantly negative effect on participation. The odds favouring participating over not participating when married decrease by 46%. This is an interesting result considering that the African race is relatively poorer than the rest and yet the tendency for one spouse to remain at home when the other participates is still

prevalent. This result stayed much the same whether rural or urban women were considered.

The presence of other income earners in the home has a positive effect on participation. The odds favouring participation when someone else in the home is employed rise by 26%. It would normally be expected that having other sources of income in the home would lower the odds favouring participation seeing that some income is being earned. However, there is a view that members of a household who are employed hear about vacancies and inform relatives at home about work opportunities (Wittenberg 1999). In addition, when other members of the household work, they make available finances for the unemployed to search for employment (Kingdon & Knight 2000). The presence of other household income could therefore be seen more as a proxy for information about the labour market as well as a source of finance for searching for employment, rather than a negative influence on the decision to work.

To incorporate employment in our analysis we need a model that takes cognisance of the fact that analysing the employed exclusively results in selectivity bias (Heckman 1993). For women to be classified as either employed or not they first have to be participants. Running a regression for the employed only would amount to disregarding non-participants, a significant part of our sample, and would thus lead to inaccurate results. The Heckman Selection model for maximum-likelihood probit estimation overcomes this problem. It is a simultaneous equation model that has a probit equation and a selection equation. In our case, employment is the dependent variable of the probit equation and participation is the dependent variable in the selection equation. However, the binary outcome, employed or not, is only observed if participation equals one.

In addition, three of the six independent variables used in this study have been identified as influencing only participation and not employment. These three variables are the presence of young children 'young ch', marital status 'married', and rural or urban location 'rural'. As mentioned earlier, we are of the opinion that the number of young children a woman has will influence her decision to participate in the labour market but will not impact on her employment status, should she decide to participate. Similar reasoning applies with respect to the effect of marital status. We see no reason why marriage should impact on chances of employment. With respect to location, our view is that people who have decided to participate in the labour force are likely to move to urban areas to seek employment. Therefore location is, in a sense, an indicator of participation status. There is no disputing the fact that the probability of employment is much higher in urban areas than in rural areas but then this effect has already been captured in the participation decision through the move to urban areas.

Table 8 reflects the results of the probit model. The coefficients of all the explanatory variables associated with employment are significant with the exception of the age quadratic variable which is barely significant at the 10% level of significance. This result implies that there is no significant change in the pattern or direction of influence of age on employment as age increases. In addition, the coefficients of the variables associated with participation are also significant with the exception of the variable 'young ch', which is insignificant even at the 10% level of significance. This finding is in agreement with that found in the participation logit earlier even though it is now part of a simultaneous model. Furthermore, the age quadratic is highly significant and of the opposite sign to the straightforward age variable in the selection equation. This result implies that there is an interesting hyperbolic relationship between age and participation. This phenomenon will be discussed later when the influence of age on participation is

analysed in more detail.

Furthermore, the reported Wald test statistic (321.21) of all coefficients in the regression model (except the constant) being zero is significant, meaning that the null hypothesis can be rejected. The Wald test reported at the bottom of the output tests the comparison of the joint likelihood of an independent probit model for the selection equation and a regression model on the observed employment data against the Heckman model (Greene 1990). This test for rho yields a $z = -2.502$ and chi squared of 6.26, both significantly different from zero at the 5% level of significance, clearly justifying the use of the Heckman selection equation.

Table 8: Maximum-likelihood Probit Estimation with Sample Selection

				Number of obs	=	11362
				Censored obs	=	3959
				Uncensored obs	=	7403
				Wald chi2(4)	=	321.21
Log likelihood = -3537031				Prob > chi2	=	0.0000
(standard errors adjusted for clustering on distrea)						
		Coef.	Robust Std. Err.	z	P> z	[95% Conf. Interval]

emply						
educat		.0627189	.0077513	8.091	0.000	.0475267 .0779112
otherinc		.4471379	.0399671	11.188	0.000	.3688038 .525472
age		.092559	.0337538	2.742	0.006	.0264028 .1587152
agesq		-.0006925	.0004141	-1.673	0.094	-.0015041 .000119
_cons		-2.672849	.7207811	-3.708	0.000	-4.085554 -1.260144

part						
young ch		-.0218683	.0211742	-1.033	0.302	-.063369 .0196323
married		-.3695728	.0321413	-11.498	0.000	-.4325685 -.306577
educat		.0492451	.0047272	10.417	0.000	.0399801 .0585102
rural		-.4885463	.037057	-13.184	0.000	-.5611767 -.4159159
otherinc		.1395218	.0317508	4.394	0.000	.0772913 .2017523
age		.1685612	.0234539	7.187	0.000	.1225924 .21453
agesq		-.0022285	.0002821	-7.899	0.000	-.0027815 -.0016756
_cons		-2.442341	.4813171	-5.074	0.000	-3.385705 -1.498977

/athrho		-.350681	.1401554	-2.502	0.012	-.6253805 -.0759815

rho		-.3369794	.12424			-.5548631 -.0758357

Wald test of indep. eqns. (rho = 0): chi2(1) =				6.26	Prob > chi2 = 0.0123	

The results are not readily interpretable in their original non-linear form therefore predicted probabilities have been calculated to aid interpretation. For example, the predicted probability of being:

$$\begin{aligned} \text{a participant is given by: } & P(y_j^{\text{select}}=1) \\ \text{an employed participant is given by : } & P(y_j^{\text{probit}}=1, y_j^{\text{select}}=1). \end{aligned}$$

Furthermore, in calculating these predicted probabilities all the independent variables are set at their sample means except for those that are specified to be set to one or zero. Henceforth all reference to probabilities should be taken to mean predicted probabilities. Seeing that education and fertility are key elements of our analysis, this is where we begin.

To trace out the impact of education, Figure 5 displays two sets of predicted probabilities by level of education. The one is a set of predicted probabilities of participating in the labour market and the other set of predicted probabilities of not only participating but being employed as well at each level of educational attainment. It is evident that the predicted probability of participating rises as educational level rises. It can also be seen that the probability of employment rises as educational attainment rises. The two graphs are fairly linear, therefore, no complex relationship between education and participation or education and employment exists. However, it is noticeable that the gap between the two graphs narrows markedly as education level increases. This reflects greater chances of employment at the highest levels of education.

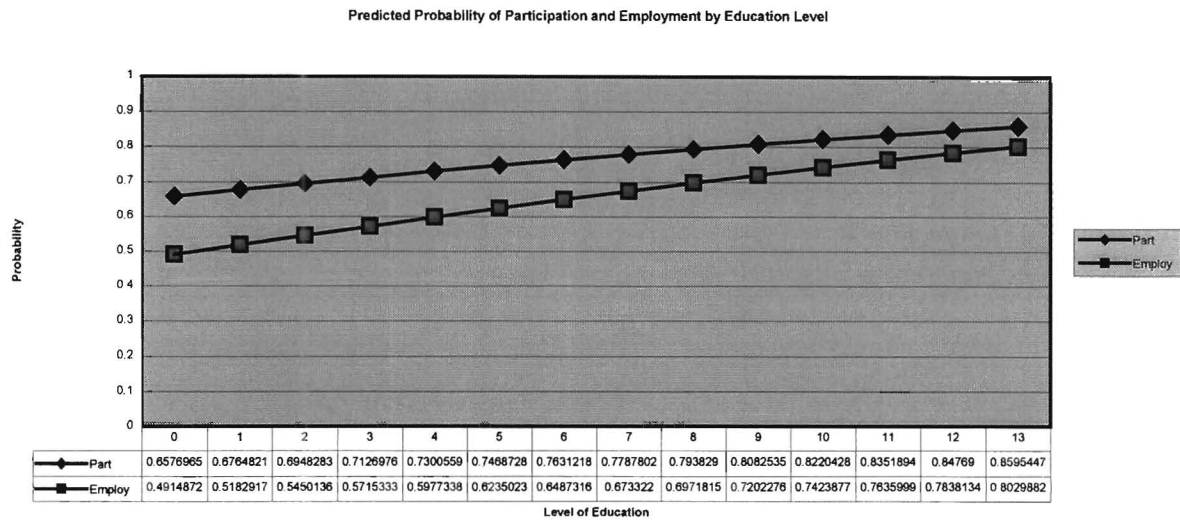


Figure 5: Predicted Probability of Participation and Employment by Education Level

Incorporating fertility into the analysis, Figure 6 graphs the predicted probability of participating in the labour force given the education level and number of young children a woman living in an urban area has. The graph has been further divided by marital status in an attempt to further investigate the earlier identified interplay between fertility and marriage. It is clear from Figure 6 that there is a negative relationship between number of young children and the predicted probability of participating in the labour market. The relative strength of this relationship is similar for both married and single women. However, it can be seen that single women have the highest probability of participating whereas married women show the least predicted probability of participating. It may seem rather surprising that there is no convergence between the probabilities for married and single women as number of children increases, however, this is perfectly consistent with the findings reported in our regression output.

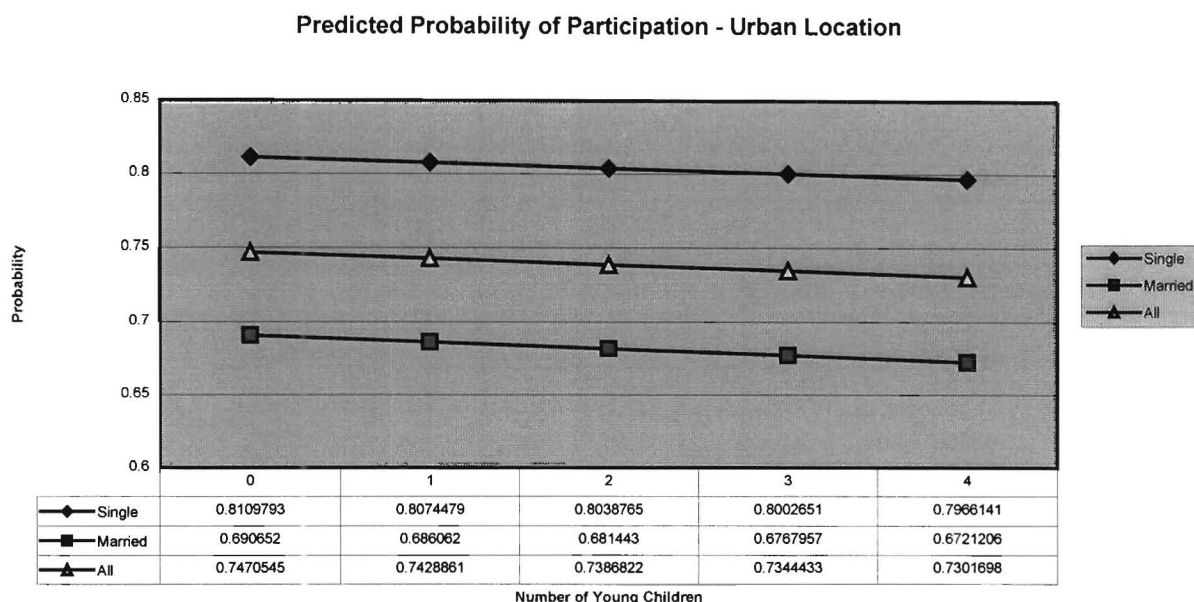


Figure 6: Predicted Probability of Participation by Young Children and Marital Status

The preceding analysis has focused on the influence of fertility and education on the probabilities of participation and employment. Attention is now shifted to the other explanatory variables in our model, in particular the three binary variables. Table 9 provides a useful display of the probabilities associated with each variable. Each variable takes on the value of one if an event occurs and zero if not. Discussion of the output is restricted to those results that are thought to be particularly interesting. Looking at marriage first, the probability of participating in the labour force is 14% higher for women who are single than it is for those who are married, holding all other variables constant. This result is hardly surprising given that of the two categories, married women are more likely to be housewives.

Table 9:

	Predicted Probabilities of Being in a Given Work Status					
	Married		Rural		Other income	
	0	1	0	1	0	1
Participating	0.739	0.602	0.745	0.601	0.637	0.689
Employed	0.615	0.624	0.635	0.604	0.508	0.702

Table 9 also shows that the predicted probability of participating in the labour force is 15% higher for women in urban areas than it is for those in rural areas. In addition, the chances of employment are 4% lower in rural areas.

With respect to having other household income, Table 9 shows that having other household income increases the chances of participating in the labour force by 5%. In addition, the probability of employment increases by 19% if there is other household income. At first glance this may seem an unlikely result, however, throughout this analysis the data has suggested that other household income serves as a proxy for information about work opportunities as well as a means to finance searching for employment. Therefore, women who live with people who are employed stand a greater chance of employment.

Figure 3 in the previous chapter showed most vividly the significant improvements in education that accompanied each successive age category. For example, 15% of women aged 50-54 had attained more than primary schooling and this figure improved to 49% for women aged 30-34. Figure 4 in turn showed how the effect of education on fertility varied with age. Therefore looking at the changes in probability of participation and employment by age category and then controlling for the binary variables, for example the 'marriage' variable, is another useful way to capture the nature of these effects on labour market decisions.

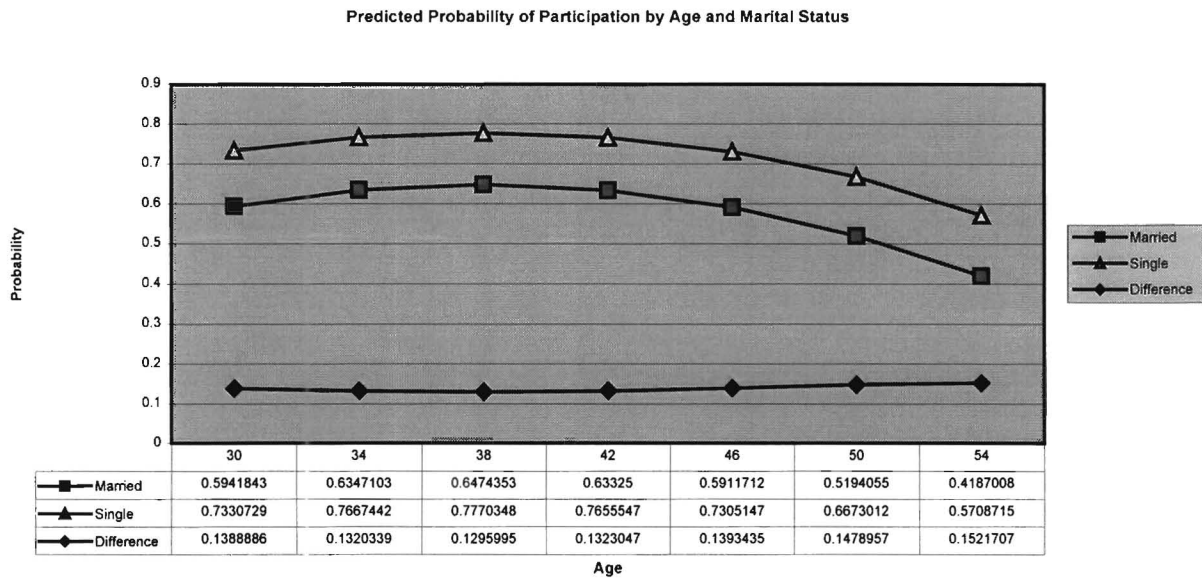


Figure 7: Predicted Probability of Participation by Age and Marital Status

Figure 7 plots the probability of participation by age for married and single women as well as the difference between the two. It is clear from the graph that the probability of participation is lowest for married women and highest for single women in all age categories. The predicted probabilities of participation display a slight upward trend initially (up to 38 years of age) followed by a downward trend with age for all three classifications. This provides graphical illustration of the selection equation result with respect to the age quadratic.

Furthermore, the graph shows that the highest probability of participation is found in the 38 year old women. For single women this value is 78% and it falls to 57% for the 54 year old women. In addition, being married as opposed to single lowers the predicted probability of participation by 13% for women who are 38 years old. This gap widens as age increases meaning that the impact of marriage on participation is more pronounced

for older women.

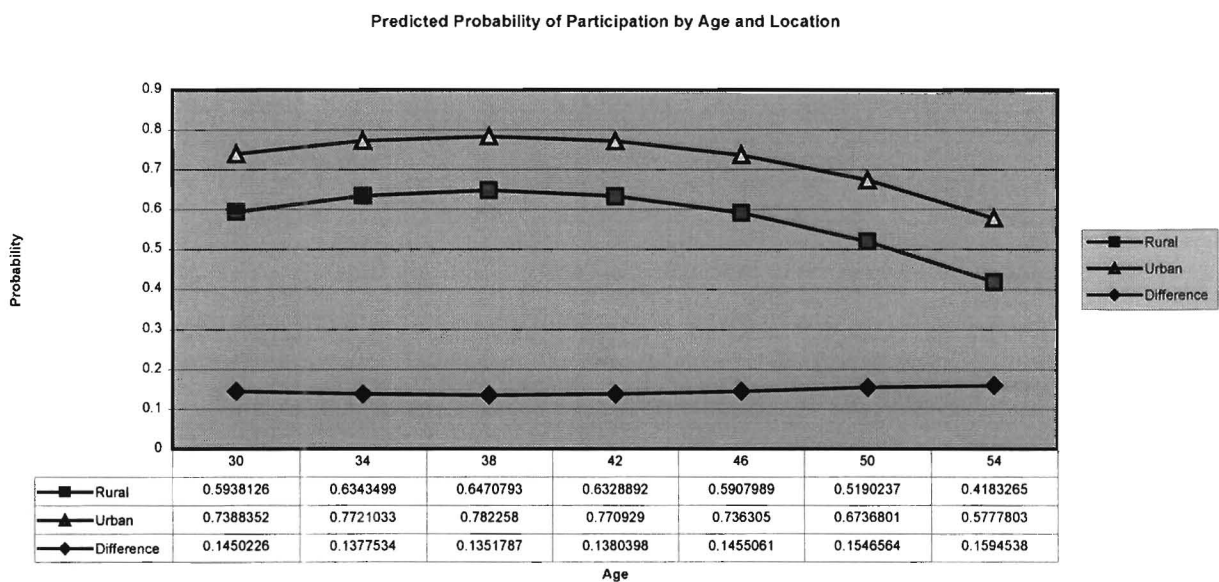


Figure 8: Predicted Probability of Participation by Age and Location

In contrast to Figure 7, Figure 8 plots the predicted probabilities of participation given rural or urban location rather than marital status. A similar pattern to that observed in Figure 7 is apparent. Urban women have a higher chance of participating in the labour market than rural women. This difference in predicted probability of participation starts off at 14.5% for 30 year old women and falls to 13.5% for 38 year old women, before rising again to peak at 15.9% for 54 year old women. It can generally be said then that location plays a larger role in women’s participation status, the older they are.

Moving on to employment, Figure 9 graphs the predicted probabilities of being employed as age changes for women within the three education levels. As can be expected, the chances of employment are lowest for those women with least schooling.

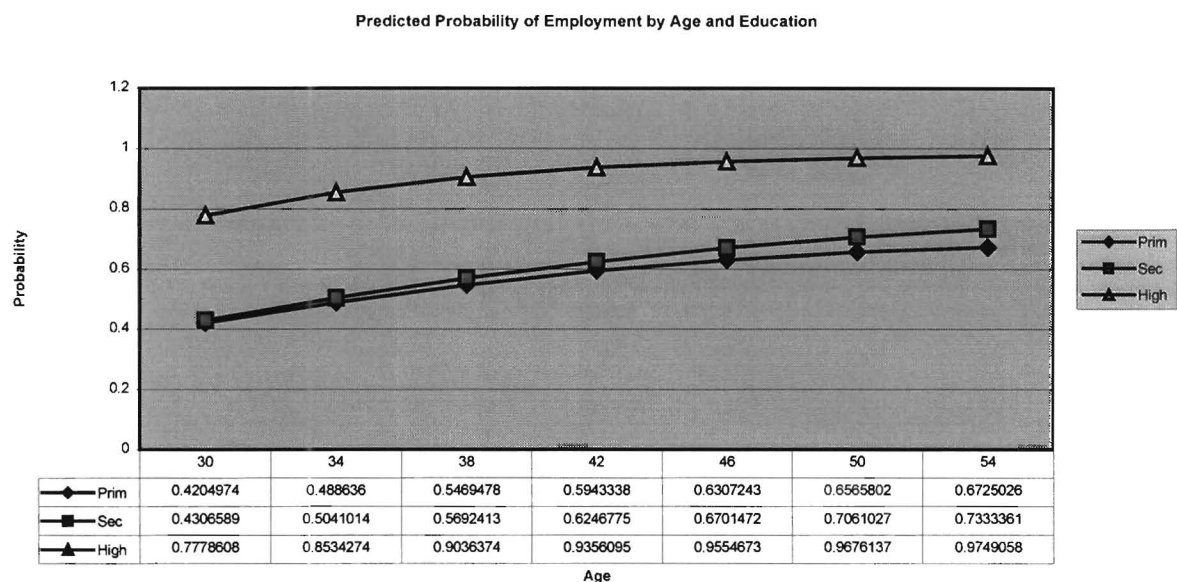


Figure 9: Predicted Probability of Employment by Age and Education

Women with incomplete secondary education have a slight edge over those with primary education. The advantage enjoyed by these women increases slightly as age increases whereas it is hardly noticeable at the lower age groups. One feature of this graph that stands out is that women with completed secondary schooling (matric) and higher qualifications (diplomas and degrees) have predicted probabilities of employment that are a great deal above the rest.

In all the regressions run thus far, the results reflect that having other household income has a significant effect on the likelihood of employment. Indeed, Figure 10 confirms this finding. The graph shows that women who have other household income have a far greater predicted probability of employment than those without these additional funds.

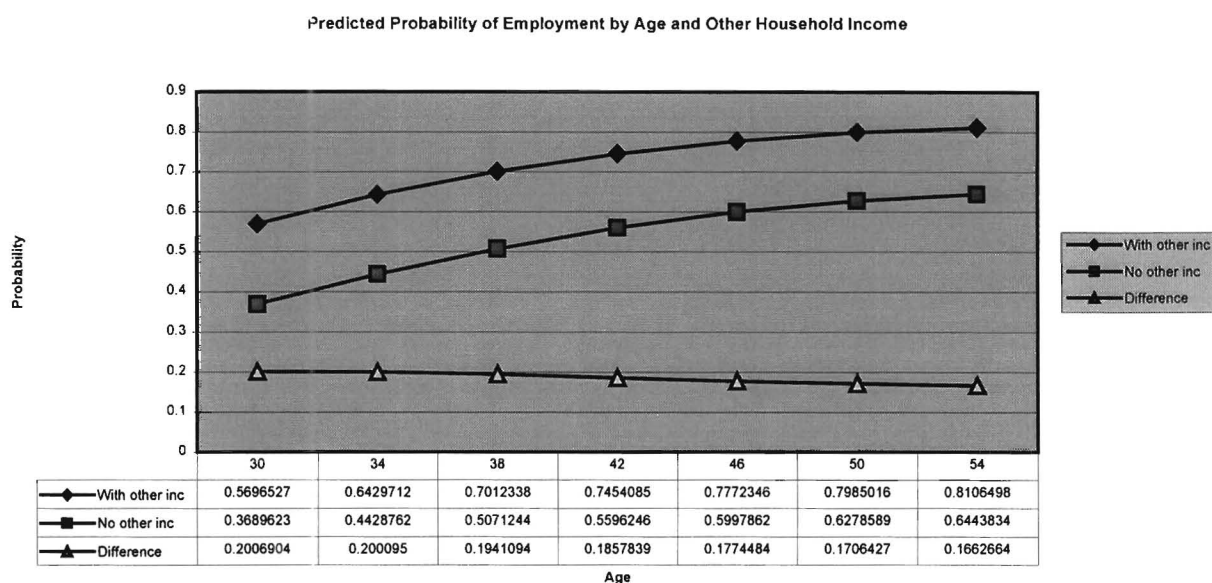


Figure 10: Predicted Probability of Employment by Age and Other Household Income

For a woman who is 30 years of age, having other household income gives her a 20% greater chance of employment than a woman of the same age without other household income. However, having other household income plays a slightly lesser role as age increases. As can be seen from Figure 10, the difference is 16.6% for women who are 54 years old as opposed to 20% for those women who are 30 years old.

4.3 Conclusion

The econometric modelling carried out in this chapter revealed a number of interesting results. It was been established that having young children does not significantly affect the participation decision of African women. Furthermore, the odds of participation over non-participation decreased by 46% for married women. It was also found that having other household income increases the predicted probability of participation by 5% whilst

increasing the likelihood of employment by 19%. In addition, being in a rural area decreases the predicted probability of participation by 20%. With regard to age, the highest predicted probability of participation was found for women in the region of 38 years of age. The predicted probability of employment, on the other hand, increased continually with age. There was little difference in the predicted probability of employment for women with primary and incomplete secondary schooling whereas those women with higher qualifications had a sizeable advantage.

Chapter 5

Conclusion

After a review of the theory of labour supply and an introduction to the data, a preliminary analysis of the data was undertaken in order to gain some background information about variables that were key to the rest of the study. These variables are education, fertility, employment and age. Furthermore, the preliminary analysis revealed that the educational attainment of African women improved over the past five decades. Although the scope of this study did not allow detailed comparison of women and men, it was observed that the improvements in women's education over time occurred at a faster rate than those of men. It was also noticed that differences in male and female educational achievement were not significant and that women's mean schooling overtook that of men for those less than thirty years of age. In addition, the data revealed that substantial improvements in educational attainment were experienced by women born after 1955. This rise in educational achievement was accompanied by delayed child bearing for women with more than primary education.

When looking at the distribution of women in different activities it has been found that as education level increases so too does the percentage of women working full-time within each education category. In addition, the number of women looking for work increases as education level rises. The data suggests that an increasing number of women move out of non-market activities and into participation in the labour market as education level rises.

Furthermore, in linking education, fertility and employment it has been found that regardless of whether a woman is in fulltime employment, looking for work, not looking for work or housekeeping, there is a negative relationship between fertility and

education. Participants also tend to have lower mean births than non-participants. Another interesting finding is that lesser educated participants have higher mean births than better educated non participants. Thus being a non-participant does not necessarily mean more births rather the influence of education has to be taken into account. By the same token, birth rates as high as 2.82 for better educated women in housekeeping suggest that there are instances where the choice on number of children is driven by chief factors other than education, such as marriage.

Moving on to the results of our modelling, an intriguing outcome was that the number of young children an African woman has does not significantly affect the participation decision. The interplay between the young children and marriage variables may have in part accounted for the insignificant result but that does not detract from the fact that with or without the marriage variable included in the regression, the effect of young children on the odds of participation is rather small. It is thought that financial constraints compel African women to work. Thus having more children necessitates more income and therefore a greater desire to work. The influence of education was found to be significant as was expected. With regard to marriage, however, it was interesting to find that there is a strong tendency for a woman to be a housekeeper when married. The logit model revealed that the odds favouring participation over non-participation, when married, decrease by 46%. In addition, the presence of other income earners in the household encourages participation. It is thought that employed household members provide those that are unemployed both information about work opportunities as well as resources to search for employment, hence the positive relationship to participation.

The results of the Heckman selection model indicate that the predicted probability of participation is positively related to schooling and that it is negatively related fertility

although, with respect to fertility, this result is not statistically significant. The effect of fertility is more pronounced for women with secondary education and this is evidenced by the fact that the probabilities of non-participation for primary and secondary approach each other at above two young children. We reach then the conclusion that women with secondary education who have more than two children, approach the same probability of non-participation as those with primary education, the more children they have.

In addition, the results revealed that the predicted probability of employment for rural women was a mere 4% lower than that of their urban counterparts. The presence of other household income increased the predicted chances of employment by 19% when compared to when there was no other income. Although there is a hyperbolic relationship between age and predicted probability of participation, it has been discovered that the predicted probability of participation generally decreases with age. The peak in probability of participation occurs at the region of women who are 38 years of age whereas the probability of employment rises continually with age.

It was mentioned in the second chapter that Winter (1997) offers the most extensive study of South African women's participation to date. As a way of showing what this paper adds to this topic, we point out areas covered by this study that Winter's failed to cover. In agreement with our findings, Winter reaches the following conclusions: that education is a good predictor of participation; that participation rates for African women peak around at the 35-39 age group, and that presence of young children does not substantially affect the participation of African women. Her main focus, however, is a comparison between male and female as well as the different race groups. Unlike this paper, she does not consider the joint influence of education and fertility on participation, neither does her study extend to investigating employment with regard to

education and fertility. The influence of other variables such as marriage, location (rural or urban), and the availability of other household income, have also not been dealt with by Winter.

In contrast to Winter (1997), focusing solely on African women has allowed us to make a far more detailed report about the role of education and fertility in the participation and employment of these women. This paper revealed how improvements in the education of African women evolved as well as how fertility patterns changed in response to these improvements. In addition, this study was not limited to participation only, but extended to employment as well. With respect to education and employment it was discovered that there is little difference in the likelihood of employment between women with primary schooling and incomplete secondary schooling. Women with higher qualifications, on the other hand, were found to enjoy a substantially greater chance of employment. In addition, we found that having other household income improved the predicted probability of employment by at least 16,6% for women who are 54 years old and as much as 20% for those who are 30 years old.

Finally, in comparing the results of this study to those of the Brazilian study by Lam and Duryea (1998), we found that like South African women, Brazilian women have enjoyed steady improvements in educational achievement over the past few decades. We also found, in accordance with Lam and Duryea (1998), that the improvements to educational achievement coincided with falling fertility rates. The Brazilian study also reflected that some women preferred using their education to invest time in raising better quality children rather than earning wages in the labour market. This feature was not apparent in the South African study. An enviable feature of the Brazilian study is that panel data was used and greater availability of this sort of data in South Africa would allow for far more

informative research in this field.

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